

# HORTICULTURAL ABSTRACTS.

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# Horticultural Abstracts

Vol. II

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## HORTICULTURE—MISCELLANEOUS.

313. SAVAGE, C. G. 634.1/8(94.4)  
**Fruit industry of New South Wales. The romance of its history : the record of its progress.**  
*Fruit Culture and Small Farming* (New South Wales), 1932, 2: 21: 4 and 2: 22: 2.

The author gives a concise but fascinating account of the industry's growth since the day when Governor Phillip on his way out procured seeds and plants at Rio de Janeiro. Present day horticulturists owe much to the zeal and energy of the early settlers. From the practical standpoint the account of the position to-day is of great interest. Thus we find that some 63% of the oranges, 47% of the lemons and 87% of other citrus areas of Australia are now in N.S. Wales. Satisfactory export markets have already been found in New Zealand, while good progress is being made in Canada and exports to the U.K. are again receiving serious consideration. The export of apples is only in its infancy, but much is hoped from the Granny Smith variety. Export of canned and preserved peaches and apricots disposes of the surplus of these fruits. A high quality dessert prune is produced, while plums are largely grown for dessert, canning and jam making. Cherries are grown on the highlands, part of the crop being exported to N. Zealand. The banana industry nearly came to a standstill some seven years ago owing to the ravages of the Bunchy Top virus, but the co-operation between growers and the Department has resulted in such good control that there are probably now some 8,000 acres under bananas (as against 5,468 in 1922 and 1,504 in 1925). Other fruits of importance are vines for drying and sale as lexias, sultanas and currants; strawberries; almonds, for which an extension of area seems advisable; while attention is called to the possibility of growing the pecan and the indigenous *Macadamia ternifolia* nut; pine-apples, mangoes and pawpaws are grown to perfection on the north coast, while the possibility of avocado growing is also under investigation.

314. MUNDY, H. G. 633/5(68.9)  
**Twenty-one years of plant introduction and trial in Southern Rhodesia.**  
*Min. Agr. and Lands, Southern Rhodesia bull.* 859, 1932, pp. 28 (being reprinted from *Rhodesia Agr. J.*, Vol. 29, No. 8).

This article contains notes on the success attending the introduction of rather more than 100 plants, of which some 43 are legumes. Among those which grow successfully and are thought to possess possibilities for use as shade bushes, lopping or green manuring in coffee and tea gardens are:—giant varieties of *Desmodium* spp., *Clitoria cajanifolia*, *Tephrosia* spp. Among fibre plants imported only the following receive favourable notice:—*Phormium tenax* (New Zealand Flax) in places where sufficient moisture can be supplied in the dry season; *Hibiscus cannabinus* (Bimlapatam Hemp); *Furcroya gigantea* (Mauritius Hemp); *Boehmeria nivea* (Silvery Ramie), extraction of the fibre presenting, however, considerable difficulty, a drawback, which



applies equally to another plant which grows readily and produces excellent quality fibre, namely *Sida* spp. Of oil seeds *Guizotea abyssinica* (Niger Seed) is noted favourably not for oil production but as a green manure crop. Of dye plants, spices and condiments the following are found to grow well:—*Pimpinella Anisum* (Aniseed); *Coriandrum sativum* (Coriander); *Glycorrhiza glabra* under irrigation; *Carthamus tinctorius* (Safflower) as a summer rainfall crop. Among other various introductions may be mentioned *Grossularia echinella*, and the suggestion is made that this species, which in its wild state occurs furthest south in the American continent, may prove useful as a stock on which to work improved types of commercial gooseberries, which ordinarily do not thrive in S. Rhodesia.

315. PIROVANO, A.

635.623 : 575.243 : 537.531

**Genetic mutations produced by electro-magnetic induction and X-rays.**

*Int. Rev. Agr.*, 1932, 23 : T.330-8.

The plants on which the experiments were made and the mutations obtained were *Cucurbita Pepo* var. *cucurbitella* known as "zucchetta romanesca" or little Roman marrow. This variety was chosen, as the type is well fixed and has never been known to be contaminated with foreign pollen. The theory which the author propounds is that molecular particles are the building elements of every organic structure; they are separated into those which are "electrically compensated" and those which possess "electric polarity." Although it is not possible to obtain scissions within the biological molecule or to act from the outside with ordinary electrical methods on molecular particles so as to obtain displacements, an electro-magnetic action exterior to the inner biological structure may cause displacement of polarized molecular fractions (ions). Summarizing, the author contends that a polarized elementary particle, when on the point of taking up a specific position within a biological structure, may be diverted or pulled from its natural path by means of an electric (or motomagnetic) force acting on the electric charge which gives it polarity. Particles so displaced may give rise to mutations. Only the simplest apparatus is required, electro-magnets traversed by an alternating current and adapted to the power and frequency to be used. These are described and illustrated. The inductions are of very low frequency, their wave-length being of from 15,000 (20 periods)—75 kilometres (4,000 periods). The electro-magnetic oscillations are thus as regards frequency the opposite of X-rays and the  $\gamma$  rays of radium. The pollen to be treated may either be placed loose between the poles or the flower bud may be so placed and the pollen left to ripen within.\* With loose pollen 12 times higher induction values are obtained, but too high powers are apt to cause lesions and hinder rather than aid mutations. Fruit setting with pollen subjected to low frequencies is easily effected, at frequencies of over 900 it is not successful. In these experiments separate batches of pollen were subjected to frequencies of 45, 300, 640 and 900 respectively for 14 hours and for purposes of comparison to X-rays (4.5 Benoist units) with a constant charge of 5 milliamperes for a time sufficient to supply 380 U.R. The pollen was applied to the female flowers immediately after treatment. The fruits ripened normally. The mean weights of the dry seeds (weighed in units of 25) of treated plants were in each case below that of the controls. In vegetative development the majority of resulting plants from treated pollen show a distinct deviation from the normal, being entirely monocaulous without side branches. Their flowers are mainly female, more abundant, and open about seven days earlier than the controls. In these unbranched plants a large proportion of the F.1 fruits are abnormal, being either of smaller size or having the pigment missing or converted into a creamy white colour. Four statistical diagrams show respectively the proportions of yield precocity, vegetatively abnormal plants and depigmentation between plants resulting from each of the treatments and the controls. Some of the more striking mutations in the fruit are photographically illustrated. Although the experiments were not undertaken to this end, certain of the mutations have proved of commercial value. Mutations in *Cucurbita* produced by electro-magnetic induction are still stable after 9 generations. The author also remarks that he has obtained two very early types of grape of good quality, the Galvani and the Volta, by electro-magnetically induced mutations.

\* When applied to the ovary the treatment results in lesions, abortions and deficient nutrition.

316. TINCKER, M. A. H. 631.588.2  
**Response of some common garden plants to the daily period of light.**  
*J. Roy. Hort. Soc.*, 1932, 57 : 321-5.

The plants observed under varying conditions of light artificially arranged are *Sedum spectabile*, *Saxifraga decipiens* var. *bathoniensis*, *Anchusa italica* var. *Pride of Dover*, and the William Pitt, Darwin tulip.

317. TINCKER, M. A. H. 631.588.2+631.83  
**The influence of the daily period of light and the supply of potassium on the rate of growth of tubers and other storage organs.**  
*J. Roy. Hort. Soc.*, 1932, 57 : 326-31.

Plants acting as experimental material were *Phaseolus multiflorus*, the "Epsom Star" and "Goldperle" dahlias and *Stachys tuberifera*, i.e. the Chinese Artichoke. Among the author's conclusions are the following :—No constant relationship between K and the dry weights of translocated compounds have been observed ; but when, under certain conditions of light, the rate of utilization of carbohydrates is low and the rate of storage rapid, a decrease in the total dry matter moved to the storage organ may result from K deficiency. Although Na can in some cases replace K, in certain species plants grown with little K are prone to suffer from water strain. For the plant's maximum development K is necessary. Nevertheless tubers and swollen roots can be formed without an abundant supply of K. The length of the period of light under which the plant is grown largely determines the use to which it puts the manufactured food products. To accelerate tuber formation short periods of light are often needed, but an adequate supply of K is advantageous, as without it the leaves do not attain their maximum efficiency as makers of carbohydrates—the products for which the tubers primarily are grown.

## TREE FRUITS, DECIDUOUS.

### Varieties.

318. .ANON. 634.17-1.521  
**Trials of varieties of hardy fruits for commercial purposes.**  
*J. Roy. Hort. Soc.*, 1932, 57 : 246-84.

This is a report on the scheme started in 1922 and carried out jointly by the Ministry and the R.H.S. at Wisley and numerous sub-stations. The object is to examine new varieties and discover what characters are favourable in them and what unfavourable for growing commercially. *Black currants*. Four well-known varieties have been used as standards, viz. Boskoop giant, Baldwin, Seabrook's Black and Goliath. These were propagated from true stocks of the varieties and 20 bushes of each were planted at each sub-station as well as at Wisley. Notes are given on cropping and growth of the above and of some sixteen new varieties. Although it is stated that the position held by the four standard varieties is not immediately challenged, favourable mention is made of Daniel's September as a late ripening currant, also of Supreme and Wallace Seedling. Of the Goliath group Invincible Giant Prolific is well spoken of, while as first earlies it is thought that Wellington Triple X and Sunrise may eventually prove more suitable for commercial planting than Boskoop Giant. *Raspberries*. Lloyd George, Baumforth's Seedling A, and Baumforth's Seedling B are the standards and some thirteen other varieties are being tried against them. As a result the three most satisfactory varieties are found now to be Lloyd George, Red Cross and Pyne's Royal, while Norfolk Giant is the most promising late variety. *Red Currants*. Fay's Prolific and Wilson's Long Bunch are taken as standards and notes are given on the growth of these and of Perfection, Laxton's No. 1 and Earliest of Fourlands, the two last showing promise. *Gooseberries*. The following are being tried :—Gautrey's Earliest, Green Gem, Bedford Yellow, Bedford Red. *Plums*. Of the twenty-two plums and damsons under trial three have been recommended for extensive trial at the sub-station, namely :—Early Laxton,



an early ripening cross between Jaune Hâtive and Early Orleans, Laxton's Gage, a cross between Green Gage and Victoria, and Cambridge Gage, a promising greengage. *Apples*. Interesting notes are given on Laxton's Superb, Herring's Pippin, St. Cecilia, Crawley Beauty, Monarch, Lord Lambourne, Arthur Turner, and on the testing of ten different varieties of McIntosh Red and of other Canadian apples received in recent years from Ottawa. *Canning*. Favourably mentioned are :—among raspberries Lloyd George, Pyne's Royal, Norfolk Giant, Duke of Cornwall, Epicure, and Brockett Hall ; among strawberries Sir Joseph Paxton, good accounts also being given of preliminary trials with Brenda Gautrey ; among currants (red) Laxton's No. 1 and Earliest of Fourlands and (black) Davison's Eight ; among plums Early Laxton. In Appendix I are given lists of desirable characteristics of different fruits, and in Appendix II descriptive notes on thirteen varieties of raspberry, twenty of black currants and seven of apples distributed for trial.

319. PETCH, T.

**The cherry in Ceylon.**

634.23(54.8)

*J. Bot.*, 1932, 70 : 229-31.

It has been stated by many writers that the cherry trees at Nuwara Eliya in Ceylon were ever-green and did not produce fruit. These incorrect statements still find their way into writings on periodicity, bud formation, etc. It had always been assumed that the cherries were of European origin, but when shown in 1921 to the late Mr. E. H. Wilson of the Arnold Arboretum, they were identified by him as *Prunus Puddum* Roxb, a well known deciduous variety indigenous to Nepaul and the Himalayan region. The author recounts a series of observations made by himself in 1927-8 on the irregular flowering of these cherries. The normal period is March, when the trees are covered in blossom, but trees could be observed in flower or partly in flower in all months from July to December. This irregular flowering is attributed partly to exposure to winds. A case is cited where owing to exceptionally strong S.W. monsoon winds blowing from March to August a tree was totally defoliated on the windward side. Towards the end of September the defoliated part of the tree came into flower, the remaining parts being in full leaf. The petals, however, were smaller and the flowers fewer than in March. In other cases old trees will flower in July while the suckers on the tree flower in March, or the branches near the base will flower in March and the upper part in July. From this the author deduces that while exposure is the main cause of this erratic flowering, individual branches also develop differences in periodicity which lead them to flower in their own time irrespective of other branches on the same tree.

### *Propagation.*

320. PALMER, R. C., AND STRACHAN, C. C.

634.11 : 575.252

**Bud variation in the apple.\***

*Scientific Agriculture*, 1932, 13 : 178-84, bibl. 6.

Observations are made on the red strains of the McIntosh and Delicious apples, and their commercial advantages. The McIntosh are graded largely according to the percentage of their surface which is covered with solid red colour. The 1930 crop from 10 striped strain trees and 10 red strain trees totalling some 70,000 apples was sorted with 3 official colour grades, Extra Fancy, Fancy, and C Grade McIntosh. The fruit was all picked within 2 days towards the end of the McIntosh harvesting season. Over half the crop of the red strain trees qualified for the Extra Fancy grade, while only 27% of the fruit from the striped strain trees could be so classed. The actual percentages were :—Extra fancy 27% and 51%, Fancy 42% and 31% and C Grade 31% and 18%, for the striped and red strain trees respectively. Investigations with the Delicious have gone a step further with most interesting results. Experimental data indicate that there are red strains of Delicious which produce a much higher percentage of Extra Fancy fruit than the original striped variety. It is also shown, however, that this early development of red colour

\* See *H.A.*, 1932, 2 : 1 : 9.

may not be altogether an advantage. It is found that the high colour on the fruit of the red strains is not necessarily accompanied by development of sugar and other characteristics which enter into the constitution of a high quality apple. In other words a red apple of a red strain may be classed as Extra Fancy and yet not be ripe. If such apples are allowed to come on to the market serious damage may be done to the Delicious trade.

321. PRICE, F. E., AND HURD, C. J. 631.53 : 631.588.1

**Electric hotbeds and propagating beds.**

*Oregon State Agr. Coll., Agr. Exp. Sta., bull. 307, 1932, pp. 29.*

The authors describe with clear illustrations the construction and methods of operating electric apparatus for heating hotbeds in which vegetable seeds are germinated and grown up to the age of transplanting direct to the field, as also for heating beds used for the propagation of cuttings. Although control beds would not appear to have been used, it is evident that considerable success was achieved in both cases. They find that under Oregon spring conditions, in which air temperatures at night often go down to 32°F., the installation of 65 feet of No. 19 soil-heating cable (440 watts at 120 volts) for each 6 × 6 ft. unit provides 12 watts per square foot and is ample. They state that commercial growers confirm their experimental results and report an even and vigorous growth of plants in these hotbeds. The description given of the installation of the cable applies equally well for installation in a propagating bed. For a small propagating bed or hotbed installation a metal tray 30" × 40" with a 200 watt heating element strung open under the metal floor of the tray is recommended. This is equipped with an adjustable thermostat and ordinary lamp cord and may be plugged into a 120 volt outlet. The power consumption for such propagating benches operated in a greenhouse (av. temp. 59°F.) was 0.8 Kwh. per sq. yard per day by the bed held at 70°F. and 1.5 Kwh. by the bed held at 80°F. Propagating beds similarly constructed and heated with electric soil-heating cable during the winter operated at temperatures approx. 10°F. less than the beds in the greenhouse with the same power consumption. Reports from growers show that rooting was on the whole quicker and more general in electrically heated beds than by ordinary greenhouse methods. These reports referred to Gardenias, Rosa Rouletti, Viburnum Carlesii, Daphnes, Magnolias, Rhododendrons, and other shrubs deciduous and evergreen.

322. ANON. 631.53 : 631.588.1

**Electric propagating trays.**

*Rural Electrification and Electro-Farming, 1932, 8 : 120.*

The trays measuring 30 in. × 40 in. can be obtained ready equipped with heating cable and can be thus easily attached to any lighting current. The loading of a cable is about 200 watts for this size of tray. It is stated that the bottom heat maintained is about 75°F. Phlox rooted in 15 days in the heated trays with a loss of less than 5%. On a similarly controlled tray without heating phlox took 3 months with a loss of 55%. [Phlox being one of the easiest plants to root given ordinary care a 55% loss points to some abnormally unfavourable condition.—Ed.] Rhododendron seed is said to have germinated in 9 days and tomato cuttings rooted in 5 days. A nurseryman now claims that he can gain 12 months in putting shrubs grown from seeds on the market by using these trays. The electricity consumption is from 40-60 units (kw.-hr.) per month. The installations have become very popular in the U.S.A. They seem to be neat and to afford an economical way of obtaining bottom heat when needed.

*Rootstocks.*

323. MOFFETT, A. A. 634.22-1.541.11 : 576.3

**Note on the cytology of *Prunus* rootstocks.**

*J. Pom. Hort. Sci., 1932, 10 : 181-3, bibl. 8.*

The material investigated was obtained from East Malling and consisted of examples of rootstocks used for working plums and allied fruits. The 2n chromosome number found was as follows :—



Common plum and common mussel 48; Broad-leaf common mussel 48 ( $\mu$ ); narrow-leaf shiny mussel, Brompton, Brussels, St. Julien A 48; St. Julien B 40; *Prunus pumila* 16 ( $\mu$ ); *Prunus tomentosa* 16. The writer considers it very probable that St. Julien "B" is a seedling resulting from a cross between *P. insititia*,  $2n=48$ , and a tetraploid form of *P. spinosa*,  $2n=32$ . Such a cross would give a pentaploid form with the intermediate chromosome number of  $2n=40$ . Similar crosses made by Crane resulted also in the expected pentaploid chromosome constitution. Work by Hedrick, Crane and others touching on the relations between these various stocks is discussed.

324. OSKAMP, J.

634.11 : 581.144.2

**Root studies of young apple trees.**

*Gartenbauwissenschaft*, 1932, 7 : 7-14.

In view of the renewed interest in rootgrowth studies these data taken from a cultivation experiment some 15 years ago at the Purdue Experiment Station are now published. The soil consisted of 70% silt, 16% clay and 14% coarse to very fine sand. Subsoil was heavy and of high water-holding capacity. Under these conditions 4-year-old Grimes apple trees, irrespective of cultivation methods adopted, had the majority of their roots within 18 inches of the surface, spreading out in a radius of 4 to 8 ft. from the trunk according to the cultural treatment and with a few straggling roots penetrating to a maximum depth of 3 ft., beyond which no roots were found. Four lots of 3 trees each, submitted to different systems of cultivation, grown as interplants between squares of permanent trees 35 ft. apart, and just completing their fourth growing season, were excavated. The method used was to dig as far as the roots continued, by successive depths of 9 inches. The soil was then screened and the roots collected, classified into 3 sizes and weighed. The writer considers that not more than 1% of the roots were so lost. The actual weights of top and roots were much greater under conditions of clean cultivation and straw mulch than under those of grass sod and grass mulch. Most of the roots under all treatments grew in a generally horizontal direction with a downward tendency. There was little difference between the cultivated and the straw mulched trees; starting with a spread of roots 16 feet in width in the first 9 inches of soil they taper down to a spread of 3-5 feet at a depth of 3 feet. The sod and grass mulch trees had a smaller spread at the surface but about the same lower down. There would appear to have been more fibrous roots in proportion to the weight of the whole root system under sod treatments than otherwise. A possible reason suggested by the writer is that the roots under sod were smaller and hence there was a smaller weight of large roots and therefore a higher percentage of fibrous roots.

*Pollination.*

325. POKROVSKAYA, A. C.

581.162.3 : 634.22 + 634.23

**Experiments on testing the sterility and cross pollination of sweet cherries and plums in 1929 in the orchard of the Soviet farm "Podgorodnoe."** [Russian-English summary.]

*Bull. Sci. Res. Inst. U.S.S.R. for Tree and Small Fruit Culture, Section of Genetics, etc.*, No. 4, 1931, pp. 86, bibl. 62.

All sweet cherry varieties tested, i.e. Franz Joseph, Jaboulay, Napoleon (pink), Dönissen's Yellow French (black), Bigarreau Reverchon, Gornaya (white), Belle of Ohio were found to be absolutely or p actually self-unfruitful. Napoleon  $\times$  Franz Joseph was also unfruitful, while only partial success was got with French  $\times$  Belle of Ohio, B. Reverchon  $\times$  Napoleon and Napoleon (pink)  $\times$  Gornaya (black). A list of particularly successful combinations is given. Among plums tested Kirk, Reine Claude green and R. purple and the Italian prune were found to be unfruitful. Victoria was self-fruitful.

*Growth, Nutrition.*

326. SPRENGER, A. M. 634.1/2-1.547-1.55  
 Groei-Vruchtbaarheid. (The relation between growth and productivity.)  
*De Fruitteelt*, 1932, 22 : 51-5.

This article is a dissertation in semi-popular form in support of the theory that a fruit tree can and should be in luxuriant growth without suffering any reduction of fruitfulness. [See also No. 387 of this issue, where the same phenomenon is described in the case of coffee growing under special conditions.—ED.] The author premises that the idea generally held is that growth and fruitfulness are opposed physiological phenomena. His opinion is that in cases where such holds good, we are confronted with an abnormal and preventable condition. It is suggested here that the state of luxuriant growth combined with a high yield can be brought about by heavy manuring, particularly with nitrogen and by reducing the pruning to a minimum. As an instance of the success of this method a photograph is given of the pears at the Lab. voor Tuinbouwplantenteelt, Wageningen. It is not to be expected that the fruiting and the growth should occur at the same point on the tree. Actually they take place at different points but simultaneously. The author suggests that a tree is not a complete individual with an indivisible internal constitution which permeates the whole tree to produce a uniform result throughout, so that, for instance, it is either fruitful or unfruitful. On the contrary every part of the tree has its own individuality of constitution, and it is by stimulating part into growth and part into fruitfulness that the results under discussion are obtained. The phenomenon of biennial bearing thus continues to occur, but instead of the tree as a whole bearing in alternate years, different parts of the tree do so instead, so that there is always a crop, and by proper feeding it should be a big one. In training the tree it is important that branches bending downwards should not be removed, since not only do these produce the most fruit but useful vegetative shoots form along their upper surface. [Precise figures for manurial treatment are not given.—ED.]

327. BARNARD, C., AND READ, F. M. 634.11 : 581.145  
 Studies of growth and fruit bud formation. I. A year's observations on Victorian apples.  
*J. Dept. Agr., Victoria* (Australia), 1932, 30 : 349-61, bibl. 40.

The paper opens with a short account of the work of previous investigators on the initiation of fruit bud formation. Attempts to apply the results of their researches to orchard practice led to conflicting results, for instance Gardner in Oregon found that summer pruning of young apples hastened their development, while Alderman and Auchter in Virginia found the method unproductive of results. Again Swarbrick in England claims to encourage fruit bud formation by ringing, while the New York Experiment Station cannot recommend it. The author considers that the results of all orchard practices vary with the chemical composition of not only the trees as regards the carbohydrate-nitrogen ratio but also as regards the balance between other elements whose influence is not yet fully understood. The chemical composition will be determined largely by the climate and soil type of the district in which the trees are growing. Apple root-stocks investigations at East Malling have classified stocks into four main groups in accordance with their effect upon the growth of scions worked on them. Here [generally speaking.—ED.] the dwarfing stocks encourage earliness of bearing while at the other end of the scale the strongest growing stocks are in the early years the least productive. Thus there is a negative correlation between growth and fruitfulness as between stock types. But within a clonal type itself there is found to be positive correlation, and the trees which make the greatest growth are the most fruitful. Therefore in dealing with vegetatively raised Northern Spy, which is practically the only stock used in Victoria, it must not be assumed that growth and fruitfulness are incompatible. The authors' investigations now outlined in this paper are based on an acceptance of Swarbrick's dynamic conception of growth in which the important factor is the date at which elongation



growth ceases rather than its total amount. Thus a stock which induces greater fruitfulness also apparently induces earlier cessation of growth. Trees with long continuing growth are less prolific in fruit bud formation. The authors accordingly have recorded systematic measurements of a large number of Victorian fruit varieties at frequent intervals throughout the year in the hope that from them may be obtained some conception of the differences between trees in different districts and of their behaviour from year to year under varying seasonal conditions. At the present stage of this investigation the initiation and development of the blossom primordia of 5 varieties of apple in 2 localities is described in detail and illustrated. Detailed observations on growth in one locality and general observations in another are related. No correlation was found between date of fruit bud initiation, date of blossoming and date of maturity of fruit. Initiation begins about 5 or 6 weeks after the spur leaves have reached full growth. An abnormal second elongation growth ascribed to excessive summer rainfall took place late in the season, during which the thickening of the older wood was interrupted. When second elongation growth occurred, blossom initiation took place over a longer period than when this extra growth did not occur. This wet season was followed by a poor crop (1931-2) and the suggestion is made and supported by a reference to the work of Lees in England that these abnormal growing conditions were responsible.

328. BARNARD, C., AND READ, F. M. 634.13 : 581.145  
**Studies of growth and fruit bud formation. II. A year's observations on Victorian pears.**  
*J. Dept. Agr., Victoria (Australia), 1932, 30 : 463-8, bibl. 9.*

The reasons for undertaking these investigations are mentioned in the previous abstract dealing with apples. The pears used in the study were William's Bon Chrétien from two districts, Templestowe in the non-irrigated southern district near Melbourne, and Shepparton, 100 miles north of Melbourne in an irrigated area having a much warmer summer climate. The pears from Shepparton were earlier in growth and crop maturity though not much earlier in the season 1930-31 in leaf burst or blossoming. At Shepparton, however (under irrigation), a second shoot elongation occurred from the terminal or sub-terminal buds of about 30% of the new laterals. Records are not available to say whether the diameter growth of the old wood ceased during this second elongation, as it did in the case of apples. Fruit bud initiation in both districts practically coincided with the cessation of growth of the lateral shoots, beginning two weeks after the spur leaves had reached full size. The main part of this paper is taken up with a description of the organization of the terminal, mixed spur bud of the pear and a detailed, illustrated discussion of the initiation and development of its floral parts.

329. MIEDZYRZECKI, CH. 634.13-1.547.4/5  
 "Seconde floraison" chez le poirier. (Second flowering in pears.)  
*J. Soc. Nat. Hort. France, 1932, 5 : 394-9.*

The author has examined this phenomenon which may often be observed in pears. He finds three types of late inflorescence: (a) Inflorescences arising like the normal ones from a flower bud but about 4 weeks later than these. This is merely a case of retarded growth and is not very common. (b) Inflorescences arising from the base of (a) inflorescences and at the same time as them. These are the commonest. They are found to vary slightly in form in different varieties. They produce numerous fruits of diverse shape and small size which ripen some weeks after the normal fruits. (c) Inflorescences born at the end of a current season's shoot. These are frequently strong and big and appear at various times. They also produce fruits, but the latter are small and distorted. The author discusses the characteristics of the above flowers

and fruits. He considers that only (b) inflorescences can be of any importance. They may be useful for providing fruit when normal fruit setting has been much reduced by rainy weather at the time of flowering.

330. PIROVANO, A.

634.13 : 551.577 : 631.547.6

L'acqua e la maturazione delle frutta. (Water and the ripening of pears.)

*L'Italia Agricola*, 1932, 69 : 429-33.

A comparison is made of the ripening dates of three varieties of pear, Williams, Beurre Clairgeau and Passe Crasane near Rome and at Somma Lombardo. Rome is very much hotter and radiation from the soil is greater. In the year 1930 a rainy summer was experienced in both localities and there was little difference in times of ripening between them, Williams being ripe between 25th-30th August at Rome and on 1st September at Somma Lombardo, Clairgeau between 18th-26th October at Rome and 10th-12th October in the north, and Passe Crasane on 20th December and at the end of December at Rome and Somma Lombardo respectively. But in 1931 there was an exceptionally dry summer at Rome, the rainfall being only 4.8 mm. (most of it falling at the end of August too late to be of any use to summer pear varieties), as against 243 mm. at Somma Lombardo. As a result Williams, a summer pear, ripened on 2nd-4th September in the north but not for another month in the Province of Rome, Beurre Clairgeau ripened nearly 4 weeks earlier at Somma Lombardo than at Rome, while in the case of the winter pear Passe Crasane, the autumn rains had come in time to ensure that ripening was not delayed at Rome and the time of ripening was nearly identical in the two places, i.e. 16th-18th December at Somma Lombardo and 18th-25th December at Rome. The composition and colouring of pears ripened in the two places is also found to differ considerably. An analytic comparison of Beurre Clairgeau pears grown at Somma Lombardo and at Rome respectively shows that the percentages were as follows : water 80.25 and 75.60, acidity as malic acid 0.102 and 0.084, reducing sugars 9.95 and 10.37, invert sugars 10.50 and 11.00, saccharose 0.52 and 0.60, volatile ethers 0.006 and 0.12. The writer considers that rain scarcity in summer under such circumstances of light and heat should not be considered disadvantageous. The ripening of summer and autumn pear varieties is delayed, which is not necessarily a disadvantage, while the fruit when ripened has most distinctive and excellent qualities of aroma, appearance and substance.

331. BOWMAN, F. T.

634.11-1.55

**Alternate cropping of apples. Its effect upon the industry of New South Wales.**

*Agr. Gaz. New South Wales*, 1932, 43 : 777-81, bibl. 1.

Tables are given to show the effect of biennial bearing on yield. These marked alternations of yield dislocate orchard routine as regards pest control measures, render the use of plant and equipment uneconomic, and make it difficult to assess the amount of labour, spray and packing materials required. The size of the fruit also causes loss. In off years it is too large for best commercial purposes and in heavy-bearing years it is often small to the point of being unmarketable. The over-large fruit develops physiological troubles, while in the heavy years the rush at harvest time leads to carelessness and consequent damage to fruit in picking and packing. Immature fruit is then often picked to relieve the trees, and this is liable to develop bitter pit during storage. Prices fall in heavy years while expenses rise ; in light years the price is good, but the reduced supply of apples brings the income below normal. These fluctuations due to alternate cropping cause the apple grower to obtain the lowest nett profit of all primary producers. The following interesting figures are quoted to show the percentages of the retail price received by growers for various classes of produce. Apple growers receive 27% of the retail price ; pear and orange growers 34% ; pea growers 44% ; bean growers 49% ; maize growers 55% ; wheat growers 83%. Instances are given to show the loss and inconvenience caused to consumers, agents and distributors, and the shipping companies.



332. CONDIT, I. J.

634.37 : 581.145.1

**The structure and development of flowers in *Ficus Carica* L.***Hilgardia*, 1932, 6 : 443-81, bibl. 49.

The author notes that literature on the cultivated fig exists in plenty from the earliest times, but that many discrepancies occur even in modern works, while accounts of such phenomena as the development of the macrogametophyte or the microgametophyte are very incomplete. This paper endeavours to cover completely the detailed floral morphology of *Ficus Carica* by description and illustration. The general morphology and the process of caprifiration are first explained. The material on which the author bases these studies was taken from the three species *Ficus Carica* L., *F. Pseudo-Carica* Mig., and *F. palmata* Forsk. He deals at length with the morphology of the staminate flowers and the development of the microgametophyte, describing the divisions of the pollen mother cells in the formation of the pollen grains. Artificial pollination of two varieties of Smyrna figs was carried out in a study of pollen tube development. The author considers the stigmatic surfaces of short-styled caprifig flowers just as favourable for the germination of pollen as that of long-styled flowers found in other types. He shows that the cells of the stigmatic surface of the styles of flowers in which the blastophaga larvæ are present are injured by the insects' ovipositors with a consequent inhibition of pollen tube growth. He describes in detail the structure of the pistillate flowers and the development of the macrogametophyte. He proposes the term *cenocarpy* to describe the production of a fruit or achene which has a normally developed ovary wall but does not contain an embryo. Such achenes are numerous in such horticultural varieties of the fig as Mission, Brown Turkey and White Marseilles. Usually a single ovule occurs within the ovary, but occasionally a second type of flower occurs with a double ovary. The author thinks that there is no reason for believing that development of endosperm in the fig flower is other than normal, even though the actual fusion of a sperm nucleus with the polar nucleus has not been observed. He describes the parthenogenetic development of endosperm.

H.M.T.

*Manuring, Cultural Practice.*

333. VINCENT, C. C.

634.1/2-1.8

**Fertilizer recommendations for horticultural crops.***Better Fruit*, 1932, 27 : 4 : 9-10.

These recommendations are based on experimental work at Experiment Stations in the N.W. States of U.S.A. An arrangement has been made whereby all investigators at the various Stations use identical methods and material. The observations are not considered final. *June drop*.—Unfavourable environmental factors exert a greater combined influence than do fertilizers upon June drop. However, either potash or phosphate used alone caused a greater June drop even with a lesser fruit set than on unfertilized plots. The vigour of the trees, which can be increased by nitrogen fertilizers, is a direct factor in determining the extent of the June drop which is greater with weak trees. Under Montana conditions where phosphorus is deficient the application of this has checked fruit drop prior to harvest. *Set of Fruit*.—Nitrogen alone has favoured an increased set of fruit compared with that on control plots and on plots manured with potash or phosphate alone. *Thinning*.—Thinning from trees receiving nitrogen alone or in combination has been greater than that from plots not receiving it : so far, however, this has not resulted in any difference in yield between the plots. *Yield* has always been increased by the addition of nitrogen where this has been a limiting factor or on some soils of phosphorus and nitrogen in combination. Annual instead of biennial bearing has been induced in the McIntosh apple in Western Montana by stimulating the vigour of the tree with nitrogen or other means to an annual terminal growth of 8 inches. *Water requirement*.—Nitrogen application by largely increasing the leaf area of the orchard may also largely increase the water requirements of the orchard.

334. McCool, M. M. 631.87  
**Value of peats for mineral soil improvement.**  
*Contributions Boyce Thompson Inst., 1932, 4 : 245-55, bibl. 11 ;*  
 and  
**Use of peats in composts to increase nitrification and plant growth.**  
*Ibidem, pp. 257-71, bibl. 5.*

In intensive production and the growth of ornamentals, when green manuring cannot ordinarily be practised, peat offers considerable promise. The author examined the physical and chemical properties of some 13 different peats. He found that their mineral content varied immensely, i.e. from 3.45-53.75%, and that they were in many cases far from being inert in the matter of nitrate formation. In one case rye grass and white clover were grown in jars containing peats to which were added varying amounts of fertilizer solution and lime. Considerable growth was made by both crops, the addition of lime being necessary in the case of the very acid peats in both cases and additional phosphorus being needed by the white clover. In a second trial several of the moist peats were used for studying their value for improving an infertile, sandy loam surface soil, and other soils or subsoils. Unproductive surface sandy loam soil, sandy loam subsoil, and sand subsoil proved to be satisfactory media for the growth of rye grass, white clover, tobacco and nasturtiums when peat and fertilizers were added to them. The best ratio of peat to mineral soil was narrower for sand than for the finer textured soils used. In the second paper the author deals with the results of growing rye grass and tomatoes in greenhouse soils to which certain of the peats described previously had been added after being composted in various ways. A very good amendment for greenhouse soils was found to be two parts of a good grade peat composted with 1 part of rye straw, fertilizer salts, lime and a small amount of manure. The ratio of manure to the sedimentary, fibrous sedge peat was varied from 1-1 to 1-40. It was found that peat composted with a small amount of manure, fertilizer salts and lime was as effective in the improvement of sandy loam soil for rye grass as it was when composted with manure in much narrower ratios. Narrower ratios of manure to peat were superior for the production of tomatoes.

335. Davey, M. 634.11-1.8  
**Treatment of devitalized apple trees.**  
*New Zealand J. Agr., 1932, 44 : 343-5.*

In New Zealand the chief factors tending to cause a debilitated condition in apple trees are (1) insufficient nutrition, (2) neglect to maintain a healthy condition of foliage, (3) overcropping, (4) lack of soil moisture, (5) poor drainage. In (1), the trouble being nutritional, the tree should be given a fertilizer rich in nitrogen and of a highly soluble nature. At present market prices sulphate of ammonia provides the maximum nitrogen at the lowest unit cost. The dose recommended is 4 lb.-6 lb. As soon as the foliage shows a marked increase in leaf area a return to a complete fertilizer is advised. (2) Maintenance of a healthy leaf system. Emphasis is laid on the devitalizing effects of heavy infestations of red mite and apple leaf hopper. It is stated that experiments by the Horticultural Division have shown that these pests can be well controlled by summer applications of emulsified oils, even one application causing an almost entire suspension of feeding by the insects, which alone seems to enable the leaves to restore their depleted chlorophyll. It is thought too that the partial suspension of transpiration due to the oil film over the leaves has a freshening effect. The need of having a vigorous leaf system to build up the fruit buds for the following season is pointed out. A strong recommendation is made to apply emulsified oil sprays immediately after harvesting any variety. (3) If the trees are not advanced in debility, overcropping may be prevented by thinning the fruit (to 1 fruit per cluster is suggested). If debility is far advanced, all fruit spurs should be removed to within  $\frac{1}{2}$  in. of the branches from which they spring. It is claimed that even this drastic measure seldom entirely eliminates the crop and that by the second season the tree will again be carrying a full crop. (4) Conservation of moisture. Since weak trees are usually shallow rooted, an effective



mulch should be maintained in dry districts. (5) Drainage. The penetration of plant foods to the subsoil is largely due to the penetration of rain water. Drainage also aerates the ground, and by raising the temperature of the soil accelerates growth in spring.

336. LYON, A. V.

634/5-1.67

**The irrigation of horticultural community settlements.**

*Council Sci. Indus. Res. Australia pamphlet 26, 1932, pp. 22. bibl. 16.*

These "Notes for the guidance of advisory boards in Murray Valley Settlements" may well prove interesting to those interested in irrigation problems in other parts of the world. The chief difficulties noted are (1) the varying seasonal requirements particularly at periods of crop maturity due to the variety of crops grown, (2) the different requirements of different soil types, (3) the long interval between the delivery of water to the first and to the last holdings in a settlement. This results in waste, early irrigators being served before the soil is actually in need of the water, so as to fulfil the requirements of the final irrigators. The irrigations actually given in the Mildura district are found to be sufficient by tests on vines in the years 1928-31 and the following recommendations are made for districts where the main crop is grapes:—(1) A winter irrigation ending about 23rd August, (2) an early spring irrigation complete 28th October, (3) a late spring irrigation complete 20th December, (4) a midsummer irrigation beginning 27th December and continued as a pre-harvest irrigation for early irrigators until about 7th February, (5) an autumn irrigation in March, (6) a late autumn irrigation in April and May. In each normal period the pumps would be working for a period of about 4 weeks. The necessity for readjustment on the occurrence of heavy rains and minor delays for light rains is recognized. The spray system is developing chiefly in the Murrumbidgee area, in which gravitational water is available at low cost to the settler for long periods at frequent intervals. In the Murray valley improvements in practice are being sought by modification of the "Flood" or "Furrow" methods. A more even distribution along the length of the furrow and a material reduction in the amount of water supplied is suggested. This would mean a shortening of the community periods for irrigation, so allowing delay in deciding the date of starting and resulting in economy and inconvenience, should rain fall in the intervening period. A closer approach to the minimum requirement represents a triple saving in that distribution costs are reduced, the productivity of the land is preserved better, and the chances of utilizing rainfall are increased. The remainder of the paper is concerned with investigations in the Mildura and Renmark areas on soil moisture changes consequent on irrigation, on the soakage rate of irrigation water into the soil under standard conditions and lastly the percolation profile of irrigation water into soils of various soil types.

337. RUTH, W. A., AND KELLEY, V. W.

634.11-1.542 : 575.7

**A study of the framework of the apple tree and its relation to longevity.**

*Univ. Illinois, Agr. Exp. Sta. bull. 376, 1932, pp. 509-636, bibl. 148.*

The aim of the investigators has been to determine the method of framing apple trees by pruning which is most calculated to lengthen their productive life under Illinois conditions. An interesting and well documented discussion of the theory of senescence indicates that unproductiveness in later years is often due to faulty pruning and training at the start. It is found also that some varieties tend more than others to productive longevity. The authors detail the results on the shape of the tree of three early treatments carried out with a varying number (usually 20 or more) of young trees (none older than 2 years, being mainly 1 year old) of different apple varieties. Among the general conclusions reached are the following:—The poor heads noticeable in Illinois orchards are to be attributed to the severe heading back of the young tree as a whip. In forming the framework very narrow angles and the excessive development of one main branch are to be avoided, as they lead to the splitting of the head. A vertical spacing is desirable to avoid smothering out the central leader. The problems of training are greatly simplified by starting the framework branches by disbudding to groups of buds. The dominance of the upper branches and the sharp forks resulting from the severe heading-back cut are thereby avoided. Uniformity

is secured among the main branches which are subordinate to the central leader and the method is well adapted for producing the modified central-leader type, a type which should be the aim. Definite recommendations as how best to carry out the method of disbudding to groups of buds and on subsequent treatment are given.

338. DURHAM, H. E. 634.37-1.542  
**Lorette pruning for figs.**  
*Gard Chron.*, 1932, 92 : 327.

The matter is still in the experimental stage, but, the article states, details are published in case others would like to make trials for themselves. In the case of the fig the idea is to prevent the premature appearance of young figs in early autumn, since these fruits cannot survive the winter in England. The method suggested is on the lines of the Lorette method of pruning peaches (quite distinct from the Lorette method for pears and apples). Applied to the fig tree the method consists in reducing the sap flow to given buds by removing the three middle lobes of the controlling leaf. This applies particularly to sturdy sappy growths, since weaker shoots are not so liable to produce fruits prematurely. The idea underlying the Lorette system is not merely to produce fruits but to produce them at desired points.

339. CROCE, F. M. 634.37-1.542  
**Poda de fructification de la higuera. (Pruning the fig for fruit production.)**  
*Revista Mensual B.A.P.*, 1932, 15 : 177 : 25-6.

Many growers do not prune their fig trees under the impression that the wounds heal with difficulty. Proper pruning however undoubtedly improves the size, colour and quality of the fruit, and healing of wounds will take place normally if the cuts are so made that no projecting stumps are left, or are made close to a bud. In the growth of the Adriatic fig several shoots may be seen emerging from one growing point ; these should be reduced to one. The Kadota fig can be pruned severely if necessary without danger of stunting the tree as may occur in the case of hard pruning of other fig varieties. The pruning applicable to all varieties consists of thinning sufficiently to admit light and heat to the centre of the tree, choosing for removal first all long or straggly shoots which are in any case unfruitful, and any which touch each other or the ground. Branches must not be allowed to develop too near the ground, or the shape of the tree will suffer.

#### Plant Protection.

340. ANDERSSSEN, F. G. 634.1/2-2.191  
**Chlorosis of deciduous fruit trees.**  
*Farming in South Africa*, 1932, 7 : 286-8.

This, in a slightly more popular form and minus the bibliography of 53, gives the information contained in Dr. Anderssen's paper entitled "Chlorosis of deciduous fruit trees due to a copper deficiency," which appeared in the *J. Pom. Hort. Sci.*, 10 : 2 : 130-146, June 1932, and was abstracted in *H.A.*, 1932, 2 : 3 : 241.

341. THOMAS, P. H., AND RAPHAEL, T. D. 634.11-2.1  
**Internal cork in apples associated with malformed wood growths.**  
*Tasmania J. Agr.*, 1932, 3 : 69-73.

Notes on a phenomenon observed in a Tasmanian orchard of Sturmer Pippin apple trees. While particularly noticeable on one tree it was also observed on other trees in the same orchard. The fruits presented a knobby, distorted outside appearance and inside showed considerable dark brown, irregular necrotic areas especially round the core. In many cases the cores and seeds were only partially developed. Current wood growths were of normal appearance and development up to within 1 or 2 inches of the tip, at which point the majority produced pubescent,



gall-like swellings. The development of the buds was not affected, but the internodes near the tip were very short, resulting in a crowning effect of the closely congregated buds. Internally these swollen areas showed indications of cell-rupture throughout, much of the rupture extending transversely along the medullary rays. The most noticeable irregularity was the failure of large portions of the parenchymatic areas to lignify properly and the occurrence in the wood of irregular brown areas apparently consisting of dead cells. The tree was 18 years old, growing on seedling stock in a light soil overlying a yellow, friable clay. Silicious hard pan sometimes occurs in this area. Pruning and manuring have been the same as on the other trees. Grafting experiments are now in progress to determine whether the disease can be transmitted to healthy trees in localities not favourable to cork and pit development.

342. CHANDLER, W. H.

632.111

**How freezing kills plants or plant parts.**

*Fruit Products J.*, 1932, 12: 50-51, 57, bibl. 11.

In this paper Professor Chandler reviews the theories on this subject of Sachs, Müller-Thurgau, Gorke, Maximov and others. With our limited knowledge of the nature of protoplasm it is only possible to depend on experience with frozen plants to explain death by freezing. Hence all theories that fail to explain all experience must be excluded, nor are experiences that can be explained by all the theories of much value. For instance increasing the amount of sugar in a plant usually increases its resistance to cold, and larger amounts of water-holding colloids in the cells are associated with greater resistance to cold. This experience can be made to fit each theory in a different way and so does not assist in arriving at the truth of any one. It is argued here that Maximov's theory (based on experiments, which are described) that death is due to the pressure against or penetration into the protoplasm of ice particles and not to chemical changes in the protoplasm itself is in harmony with experience. It is known that water in freezing plant tissue moves out into the air-filled spaces between the cells away from the protoplasm. Hence a gradual fall of temperature allowing the water time to move does less damage than does the sudden instead of gradual subjection of the material to a low temperature. Thus winter wood has been killed when placed suddenly in a temperature of  $-17^{\circ}\text{C}$ ., while in a temperature falling slowly in 12 hours to  $-27^{\circ}\text{C}$ . it remained for 24 hours and longer without injury. In very succulent plant parts which have little space for water to move away from the protoplasm a slow fall of temperature seems to kill as quickly as a rapid one. It is emphasized that this theory of the ice particles pressing upon the protoplasm and so killing it only applies to the killing of the cells by the influence able to kill them at the highest temperature. It does not follow that at a lower temperature other changes might not take place, such as the crystallization of some of the material in the sap, which would leave unopposed other material that does not crystallize out except at a still lower temperature and so lead to disorganization and death of the protoplasm.

343. POKROVSKAYA, A. C.

634.1/2-2.111

**Observations on the freezing of fruit varieties after the winter of 1928-29 in the orchard of the Soviet farm Podgorodnoe.**

*In Bull. Sci. Res. Inst. U.S.S.R. for Tree and Small Fruit Culture, Section of Genetics, etc.*, No. 4, 1931, pp. 86, bibl. 62.

The weather characteristics of this year were excessive, i.e. nearly double the normal rainfall in autumn and winter, and temperature much below the average. The second half of December was marked by sharp fluctuations in temperature. Among points noted in the summary are the following: —Buds of sweet cherries on *P. Mahaleb* did not suffer much, while those on *P. Avium* were killed. Of sour cherries the hardest were Lotovka Late, Minister Podbelsky and Montmorency, the most susceptible being hybrids of *P. Avium*, Reine Hortense, Early English and Choisy. The fruit buds of pear varieties budded on Triomphe de Jadoigne as an intermediate on quince were frozen badly except Clapp's Favourite, Marguerite Marillat and Early Williams, while pears budded on *P. communis* suffered no serious injury. Apples were not seriously affected.

344. WORMALD, H. 634.1/2-2.42  
**Blossom wilt of fruit trees.**  
*J. Min. Agr.*, 1932, 39 : 620-6.

Attention is drawn to severe outbreaks of *Sclerotinia cinerea* which occurred in 1932 on cherry, plum and apple trees resulting in a serious reduction in crops. The causes are discussed and measures for preventing epidemics are recommended. Stress is laid on the necessity for routine cutting out of brown rot cankers and of all infected spurs and twigs. [From author's summary.]

345. ANON. 632.7 : 631.588.1  
**The gardener's friend.**  
*Rural Electrification and Electro Farming*, 1932, 8 : 140-1.

A description of an apparatus named the Insekiller which the inventors claim will act as an efficient control over garden and greenhouse insect pests by attracting them to a 75 watt electric lamp and electrocuting them on arrival. The apparatus has been tested extensively in the open and under glass and is stated to be effective. A development that seems to have real practical value is the Insekiller Screen. This is a kind of grid to fix over windows or other apertures of stables, dairies, etc. The wires are charged and a trough catches the victims as they attempt to fly through the screen either from inside to reach the daylight beyond or from outside to visit the food, manure, etc., that may be within. Two screens installed over the open windows of a dairy have been known to electrocute 25,000 flies in a day. The running cost is said to be low.

346. EVANS, J. W. 634.11-2.73  
**The bionomics and economic importance of *Thrips imaginis* Bagnall.**  
*Council for Sci. Indus. Res. (Australia) pamphlet* 30, 1932, pp. 48, bibl. 33.

The primary effect of infestations by this indigenous insect is a reduction in crop. The secondary effect is to set up State-wide fluctuation of crops. Spring outbreaks follow abnormally heavy autumn and winter rain. The activities of the insects in spring are largely regulated by weather, mainly temperature. Control measures are discussed but no simple remedy is advocated. Special attention is paid to the question of repellents. Little hope is offered of biological control. [From author's summary.]

347. CERONI, R. R. 632.951.1  
 Il piretro. Prove sperimentali di coltivazione e della sua azione. (Pyrethrum.  
**Methods of growing and toxicity.)\***  
*L'Italia Agricola*, 1932, 69 : 917-33, bibl. 31.

The authors state that pyrethrum is indigenous to the district lying between Istria and Northern Albania, that it is grown in vast quantities along the Dalmatian coast, that the powder is made chiefly at Trieste and that European supplies are mainly concentrated at Trieste, Vienna and Berlin. Dalmatian pyrethrum is xerophilous and grows well in calcareous soils. It likes a dry climate with very hot summers. It can stand long periods of drought and at the same time is not damaged by winter temperatures of  $-8^{\circ}$  to  $-10^{\circ}\text{C}$ . ( $14.4$  to  $18$  degrees of frost F.). It cannot exist under conditions of ill-drained clay soils or long periods of cloudy weather. Very deep fertile soils are not good, as they tend to produce extravagant growth with accompanying lack of vitality and potency of the plant products. All trials tend to show that pyrethrum can grow wherever the vine and olive grows and can in fact be grown in association with these. As regards diseases *Sclerotinia libertiana* may be fatal on very thin soils. Certain insects may also damage it, such as the root-eating *Haplidia transversa* and *Pentodon punctatum*, and *Phytoecia* species. The writers have only found *Phytoecia virgula* on pyrethrum plants which had, possibly owing to prolonged cultivation, lost their insecticidal properties. They note in this connection

\* See *H.A.*, 1932, 2 : 1 : 29 and 2 : 3 : 243.



that these properties are found to be reduced in plants growing in soil very rich in potash. They consider at some length previous work dealing with the method of determining the degree of toxicity of pyrethrum dust, its exact action on insect functions and the different theories on the subject. They grew seed from different sources with widely differing results and state that "the number of flowers per plant and hence the pyrethrum obtained, varies tremendously, i.e. from 30-80." The average weight of dried heads was 200 mmg., the average product in dried heads per plant being 10-15 gr. This is said to agree with French and Japanese production figures. Hand-picking was the normal mode of harvesting, though mowing was also tried, care being taken to see that the plants were not wet with rain or dew in the latter case. The product was dried and ground and divided into 4 lots: (1) powder made from open flower heads; (2) powder made from closed flower heads; (3) powder made from flower stalks and flower heads; (4) powder made from the whole plant obtained by mowing. The different powders were submitted to what the writers call their "metodo biologico." Insects were enclosed in a 200 cc. vessel, a given quantity of dust was blown on to them, the vessel was corked and the time elapsing before their death was noted. The house fly and different types of ant were used. According to this rough and ready method no difference in lethal effect was noticeable between powder from closed and open flower heads, but the powder from the heads was found to be much more deadly than powder from the rest of the plant or from the flower heads and flower stalks mixed. Although the lethal power of the wild plants was found to be greater than that of the cultivated, the writers consider that the ease of cultivation and the demand for pyrethrum ensure a bright future for the growing of this crop.

The following also are noted:—

O'BRIEN, D. G., AND M'NAUGHTON, E. J. **The endotrophic mycorrhiza of strawberries and its significance.** *West of Scotland Res. bull.* 1, 1928, pp. 32, bibl. 42.

ANAGNOSTOPOULOS, P.Th. **Blastomanie de l'Amandier (Blastomania of the almond caused by *Cecidomyia amygdali*).** *Rev. Pathologie vegetale et d'entomologie agricole*, June-July, 1929, pp. 12.

ANAGNOSTOPOULOS, P.Th. **The withering of shoot tips in the fig.** [Greek-English summary.] *The New Agricultural Life*, 19 June 1932, 2 pp.

SAMUEL, G. AND OTHERS, AND BALD, J. G., AND SAMUEL, G. **Investigations on "Spotted Wilt" of Tomatoes. I. and II.** *Council for Sci. and Ind. Res., Australia, bulls.* 44 of 1930 and 54 of 1931.

BERKELEY, G. H., AND MADDEN, G. O. **Transmission of streak and mosaic diseases of tomato through seed.** *Scientific Agriculture*, 1932, 13: 194-7, bibl. 11.

BALL, E. D., AND OTHERS. **Some major celery insects in Florida.** *Univ. Florida Agr. Exp. Sta. bull.* 250, 1932, pp. 22. (*Phlyctaenia rubigalis*, *Autographa falcifera*, *Noctuidae* spp., *Xylomyges eridania*, *Tetranychus telarius*.)

STONE, W. E., AND OTHERS. **Control of the celery leaf-tier (*Phlyctaenia rubigalis*) in Florida.** *Univ. Florida Agr. Exp. Sta. bull.* 251, 1932, pp. 23.

GOFF, C. C. AND TISSOT, A. N. **The melon aphid (*Aphis gossypii* Glover).** *Univ. Florida Agr. Exp. Sta. bull.* 252, 1932, pp. 23.

ANAGNOSTOPOULOS, P.Th. **The scolax beetle of the melon and its control.** [Greek-English summary.] *New Agricultural Life*, September, 1931, 2 pp.

ANAGNOSTOPOULOS, P.Th. **Two walnut pests, *Oberea linearis* and *Carpocapsa pomonella*.** [Greek-English summary.] *New Agricultural Life*, August 7th, 1932, 4 pp.

CUNNINGHAM, G. H. **Orchard sprays in New Zealand. I. The sulphur series.** *New Zealand J. Agr.*, 1932, 44: 177-86, bibl. 12. **II. The lime-sulphur series,** *ibid.* pp. 263-9, bibl. 19. **III. The copper series,** *ibid.* 45: 33-9 and 70-77, bibl. 30.

## SMALL FRUITS, VINES, NUTS.

348. GRUBER, F.  
 Beerenobstzüchtung. (Small fruit breeding.)  
 Züchter, 1932, 4 : 237-42, bibl. 21.

634.7-1.523

The writer discusses the origin and present position of the different species and varieties of *Rubus*, *Ribes* and *Fragaria* grown nowadays in Germany and the problems on which German geneticists are now working. As regards raspberries he considers the following to be perhaps the most important for breeding work : *R. idaeus* the European red raspberry, *R. strigosus* the American red raspberry and *R. occidentalis* the American black raspberry. Another large division of the genus *Rubus* includes the various blackberries. In breeding for disease resistance, especially to *Didymella applanata*, raspberry  $\times$  blackberry crosses are important, although no great success has yet been achieved with them. The chief cause of their failure may well lie in their different chromosome make-up, raspberries being mainly diploid ( $2n=14$ ) while blackberries show every grade of heteroploidy from tetraploidy to octaploidy. By back crossing the F1 and F2 generations with raspberries it is hoped to get a late ripening raspberry. *Ribes*. Present-day red and white currants originated from three kinds, *R. vulgare*, *R. rubrum*, and *R. petraeum*. The chief aim of the breeder is to get a variety resistant to *Gloeosporium Ribis*, and varieties with less acid fruits containing fewer seeds. All European varieties of black currants are derived from *R. nigrum*. One of the chief problems with gooseberries is the production of gooseberries immune or highly resistant to American gooseberry mildew (*Spaerotheca mors-uvae*) and possessing large berries. This entails a lengthy process which starts with crossing the European *Ribes grossularia* with the American *R. oxyacanthoides* and *R. cynosbati*, the F1 generation generally producing small worthless fruit. The F2 generation shows remarkable divergence in form and mildew resistance. Yearly some 15,000 seedlings derived from free pollinated fruits of crosses and from the results of recrossing these with large fruited varieties are submitted to mildew infection, and only those which show resistance to mildew and leaf fall in conjunction with good fruit qualities escape rejection. Another promising cross under observation is that of the "Grüne Riesenbeere"  $\times$  *R. pinetorum*, while the so-called "Jochelbeere" \* is an interesting cross between *R. succirubrum* and *R. grossularia* and should prove useful for future crossing work. *Fragaria*. Of strawberries the European *Fragaria vesca* was of great importance up till the beginning of the eighteenth century, but the turning point in strawberry growing was the introduction of the Chilean strawberry *F. chiloensis* by Captain Frezier (hence the French name "fraisier"). The cultivated strawberry of to-day nearly always possesses blood of *F. chiloensis*, and of the American "scarlet strawberry" *F. virginia*. Among the strawberry characters which the breeder is aiming for are : upright growth, highly coloured juice in strawberries for preserving, uniformity and good development of fruit with sepals bending backwards, the production of two crops a season, the combination of the aroma of the wild strawberry with the size of the ordinary garden variety. Good cropping capacity and disease resistance are also essentials, as also the possession of hermaphrodite flowers. The material for crossing is ample and the process easy.

349. LIND, G. 634.711  
 Avkastningsförsök med hallon vid Experimentalfältet. (Yield trials with  
 raspberries at Experimentalfältet.)  
 Sveriges Pomologiska Förenings Årsskrift, 1932, 33 : 1-12.

These trials have been in progress since 1924 at Alnarp and elsewhere. The varieties originally chosen were Baumforth's Seedling, Hornet, Lloyd George, Pyne's Royal and Superlative. To

\* Presumably the combination of the German words for gooseberry and currant, i.e., Stachelbeere and Johannisbeere. Ed.



these were added in 1925 Asker and Schwabenstolz which proved to be synonymous. Baumforth's Seedling was soon eliminated as being insufficiently hardy for these latitudes. Hornet and Superlative (obtained from a German firm) were full of rogues and had also to be discontinued. Pyne's Royal was finally rejected owing to the difficulty of detaching the fruit from the plugs without squashing it. Also it failed to stool well. Preussen was then tried but proved not to be hardy. Thus the only varieties remaining in the trials were Lloyd George and Asker. The method of cultivation finally adopted was that used in the raspberry districts of Asker in Norway. In this method the plants are set out 1 m. apart and 2 m. between the rows, wider intervals than are customary in Sweden. The shoots are reduced to five, those that are left being carefully attached by means of Gjelstad's raspberry shoot holder to wires running along the rows at 60 cms. and 130 cms. from the ground, and the soil is very thoroughly worked and manured. The highest ground available is used for Lloyd George, since this occasionally suffers damage in low lying positions. Asker is completely hardy. The plantings should be made of root shoots from trained and not from untrained plants. The product of the trained plant is sufficiently robust to stand transplanting at any time of year and in any vegetative condition, whereas shoots taken from untrained plants often fail. In these trials four weedings were found necessary during summer, and all young shoots were removed as soon as they appeared above ground with the exception of those retained to fruit in the succeeding year. The old shoots were removed immediately after harvest. The new shoots were not topped till vegetation started in May. Autumn or earlier spring topping leads to excessive bleeding. A yearly application of 200 kgs. 20% superphosphate and 100 kgs. 40% potash per hectare was given and hoed in, and every third autumn a dressing of well rotted horse or cattle manure was given at the rate of 9-10 cms. per 1,000 sq. m. Instructions for harvesting and packing follow. Yearly tables of receipts and expenditures are then given to show that cultivation on these careful lines will result in a profit, whereas plantations run in the old unmethodical lines fail to pay. When there was a glut of raspberries in the Swedish market the Experiment Station fruit was selling at high prices, the demand exceeding the supply. Comparing the two trial varieties it is considered that Asker is superior in flavour and Lloyd George in size and appearance. [Full translation available.]

350.

PIPER, A.

634.713

**Cultivated blackberries.***J. Min. Agr.*, 1932, 39 : 649-56.

Notes on the cultivation of two varieties of the cultivated blackberry, which has only been grown for a short time in England. Himalayan Giant (*Rubus procerus*) grows very strongly, producing very stout canes, sometimes up to 15-20 ft. long on good soils. The flavour of the berries is not so good as in the case of Parsley Leaf (*R. laciniatus*), the other variety described, but on the whole it has proved more satisfactory than the latter. Wilson Junior, a third variety, was entirely unsuccessful at Wye. Any soil sufficiently well drained will grow Himalayan Giant, but Parsley Leaf and the weaker-growing types need a richer, deeper soil. *Propagation.* The best method is from tips. Young canes of the current year's growth are used, and the terminal bud must be intact. The actual method is described. A second method of propagation is by cuttings, which are taken from the fruited laterals when the canes have finished or nearly finished fruiting at the end of October. This is a slower method. Propagation from seed is not recommended. Generous manuring is advised. Wirework supports are described and their merits discussed. Pruning should consist of cutting off the old canes close to the ground as soon as possible after fruiting, and the young canes should then be trained for fruiting in the following summer. Among pests and diseases are noted the raspberry or loganberry beetle (*Byturus tomentosus*) and crown gall (*Bacterium tumefaciens*).

The following also is noted :—

MINISTRY OF AGRICULTURE & FISHERIES. **Loganberry cultivation.** *Advisory leaflet 129, 1932, pp. 4.*

351. KNIGHT, LUCY D. M., AND WALLACE, T. 634.75-1.8  
**The effects of various manurial treatments on the chemical composition of strawberries.**  
*J. Pom. Hort. Sci.*, 1932, 10 : 147-80, bibl. 26.

The authors briefly review previous work in Europe and America on manuring of strawberries. They then describe the lay-out and methods of experimentation adopted by themselves. The plots, each of  $\frac{1}{16}$ th acre, were arranged in chequer board fashion and each treatment was given in triplicate. When the samples analyzed and commented on in the present paper were taken, the plots had been under the manurial treatments continuously for 7 years, and the plants were in their second and main year of cropping. Cultural operations ensured conditions favourable to the growth of excellent plants. The latter were not allowed to develop runners at any time, but were grown for fruit only. Notes on weather, methods of sampling in field and laboratory and chemical determinations are given and the results of the latter are shown in tables and graphs. Manurial treatments given were : farmyard manure ; half doses of farmyard manure plus sulphate of ammonia, supers and sulphate of potash ; shoddy plus steamed bone flour and sulphate of potash ; dried blood, steamed bone flour and sulphate of potash ; sulphate of ammonia, supers, sulphate of potash ; dried blood and steamed bone flour ; no manure. The shoddy and farmyard manure were ploughed in before planting, the remainder were applied in spring. Vegetative growth was strong in all plots owing to the wet weather, but potassium deficient plots were much behind the others in this respect. A positive correlation was found between vigour of plants and resulting yield. Potassium deficient plots had the lightest crops and the fruits were small. The nitrogen content of the fruits decreased over the picking season and was highest where inorganic manures were used. There was a negative correlation between nitrogen content and acidity and between nitrogen content and total sugars. The acid contents of the fruits were lowest in plots receiving no potassium. The control plot yielded fruit with the highest total sugar content and the highest reducing sugar content. The fruit from the "no potash" plot was lowest in sucrose. The potassium deficient fruits had an exceptionally low ash percentage, while the inorganic fertilizers produced the highest. The ash from farmyard manure plots alone was low. There was a positive correlation between potassium content in the ash and total ash content, and farmyard manure was shown to be an efficient source of potassium. There were negative correlations between potassium content and calcium and sodium content, but the percentages of magnesium and phosphorus showed no discernible relationships to the other elements or to each other. The chemical analysis confirms observations made on the plots that potassium deficiency is here an important factor and shows that the application of potassic fertilizers is clearly reflected in the chemical composition of the fruit.

352. DE CASTELLA, F. 634.8-1.542  
**Summer pruning of the vine. Shoot and bunch control.**  
*J. Dept. Agr. Victoria (Australia)*, 1932, 30 : 447-8.

The author distinguishes between disbudding, stopping, and topping. *Disbudding* is the removal of such sprouting buds as bear no fruit and will not be needed at next dry pruning. Its weakening effect is trifling and it is nearly always useful particularly in the case of young vines that are being shaped. It should be done early. *Stopping* is the suppression of the growing tip of a young shoot. It checks the growth of the shoot, diverting the sap into buds that otherwise might not sprout and may be required for next year's dry pruning. It is seldom necessary but can be useful in shaping young vines during the second and third year. *Topping* is a more drastic form of stopping carried out after blossoming or later. Here the shoot is cut back by several internodes. The system is stated to be seldom useful and generally harmful, particularly in warm climates. It is often used by growers who like to see a neat row of vines, but, if practised frequently, the effect is to cause premature decline and unfruitfulness. It should be applied if at all only to strong growing vines which have been overmanured and overwatered. Other forms of control mentioned are girdling, a necessity in the case of the Zante currant which otherwise sheds its fruit shortly after blossom. In this case the main stem is girdled, a ring of bark



$\frac{1}{2}$  in. wide being removed. Other vines often resent the treatment and in their case it should be done on the rod, not on the main trunk. *Bunch control.* If too many bunches are left, they are scraggy, thin and unsaleable. Bunch limitation by hard pruning is the custom of growers of Gordo Blanco. The author considers it could be better done with less strain on the vine by eliminating surplus bunches as early as possible before blossoming. Trimming of bunches and berry thinning can be carried out later. Partial foliage removal in autumn to allow the grapes to dry quickly reduces mould development. It must be done with discretion or the accumulation of sugar will be seriously disorganized.

353. DE CASTELLA, F.

634.8-1.67

**Winter irrigation of vineyards.\****J. Dept. Agr. Victoria (Australia), 1932, 30 : 340-2.*

It is here contended that the usual practice of giving a heavy irrigation when the vines are in full growth in summer tends to produce excessive vegetation at the expense of the fruit. In European vine-growing countries, where the water supply is mainly dependent on rainfall, there is usually a heavy winter precipitation followed by a dry or fairly dry summer. It is argued here that these conditions should be imitated in the vine-growing districts of Australia, which are dependent on irrigation. A copious winter watering, under Australian conditions, should be given in August, this being the most suitable month culturally. The next watering need not be given until November or December, though wilting point should never be quite reached or the young berries will drop. January and February waterings can be given if required as they probably will be in a dry climate. An instance is cited in which the use of winter watering raised the yield for an old vineyard near Sunbury from 70 gallons to 400 gallons per acre.

354. ANON.

634.873.2(393)

**Sultana cultivation in Cyprus.***Agr. Supplement No. 52, to Cyprus Gazette, No. 2248, 1932, pp. 1-2.*

Cyprus growers are slow to take up the cultivation of sultanas although consignments from Cyprus have been very favourably received in the London markets. This lack of enthusiasm on the part of growers is ascribed to the fact that the sultana requires somewhat different treatment to the ordinary grape vine and they do not fully understand it. The essential points of treatment under Cyprus conditions are as follows :—A good fresh, light soil is required. Where this is not obtainable the difficulty may be overcome to some extent by grafting the sultana on the local white grape Xynisteri, a deep-rooted, drought-resisting variety. Cuttings are slow to root, and if placed directly in the field there will be many failures the first year. It is advisable to obtain cuttings already rooted from a reliable source such as the Government Vine Nurseries. They should be of medium size and close-jointed. They should be taken in December, stratified in earth till March and then planted. Winter pruning of sultanas differs from that of other vines. The sultana generally fruits from the fourth bud from the base, therefore short pruning will produce a short crop. The green shoots are topped during the summer. Two irrigations given during summer will increase the yield and size of berry but the quality may suffer. A tendency to flower-dropping indicates the need for care in the application of artificial fertilizers. It is suggested that they should be poor in nitrogen and rich in potash and phosphorus.

355. MOUNTS, BERYL T.

581.144.4

**The development of foliage leaves.***University of Iowa Studies in Natural History, 1932, 14 : 5 : 1-19, bibl. 9.*

The paper presents the results of a study of leaf development in *Vitis vulpina* L. (Wild grape) and *Catalpa bignonioides* Walt. Summarizing here the observations on *Vitis* only it is noted

\* See also 336.

that the leaf arises as a lateral protuberance on the stem, the stipules appearing as small protuberances on the central papilla when it is very small, 60-100 $\mu$  long. Six distinct cell layers are visible, three of them giving rise to the spongy mesophyll. The apical tip is well marked in the embryonic stages. Lateral papillae develop with the lobes and teeth. The cell layers begin to differentiate with epidermis, palisade and spongy mesophyll when the blade is 5-8 mm. long. Cell division except that concerned in vascular development ceases when the leaf is approximately 2 cm. long. Stomata do not all become functional at the same time; some guard cells are barely differentiated when other stomata of the same leaf area are mature. Growth is uniform over the leaf blade except that the apical point develops early and soon ceases growth. The development from primordium to maturity under the local summer conditions occupied about 40 days. The upper epidermis increases in area to more than twice that of the total cross sectional area of the adjacent palisades at midplane. The intercellular spaces are schizogenous in origin, their development being largely due to the greater expansion of the epidermal layers tending to separate the cells of palisade and mesophyll tissue. The epidermis provides the major mechanical support in the islet area in addition to aiding in leaf expansion.

356. CROCE, F. M. 634.55-1.542  
 Poda de fructification del almendro. (**Pruning for fruit production in the almond.**)  
*Revista Mensual B.A.P.*, 1932, 15 : 176 : 47-48.

The almond produces most of its fruit on spurs and a minor quantity on shoots of a year's growth as in the varieties California and Jordan. A fruiting branch can be considered as bearing economically for 5 years, after which period it should be removed. Thus, when the tree is formed and pruning for shape is no longer necessary, it should be a routine practice to remove a fifth of the fruiting branches every year. As the almond fruits along its shoots rather than at the extremities, emphasis is laid on the necessity for keeping the tree open to admit of light and air penetrating to all its parts. In selecting branches for removal all those having a diameter of less than 3 cm. can be cut out, provided they are of more than a year's growth. If the tree is not growing strongly, harder pruning should be resorted to. As a guide it is mentioned that the normal average growth of the year's shoots should be from 22-45 cm. if the tree is less than 10 years old, and from 15-20 cm. if the tree is over 10 years old. If the growth falls below these figures pruning should be severe, but if more vigorous, it should be relaxed. Excessive vegetation due to rich soil may require an entire suspension of pruning. Since the crop is harvested by means of long staves it is not necessary to keep the top of the tree lower than can be reached with a 5 metre pole. [Full translation available.]

357. QUINN, G. 634.55  
**The almond in South Australia.\***  
*Dept. Agr. S. Australia*, bull. 220, 1929, pp. 19.

Articles on growing almonds are rare and many practical points will be found in this bulletin. Almond trees irrigated and kept growing late in the autumn do not start into growth so early in spring and hence do not suffer so much risk from spring frosts. The almond is very susceptible to excessive wetness in the root area. It thrives best in S. Australia where annual rainfall ranges from 18 to 23 in. or where an equivalent is given in irrigation water. The hot dry atmosphere of the Murray Valley combined with irrigation is found particularly suitable. Propagation is by budding on seedlings usually of the hardshelled type owing probably in the author's opinion to the smaller market value of the nuts of this type. The late autumn is preferable to the winter for planting the young budded trees out into the orchard. Soil cultivations should aim at moisture conservation. Pruning in early years should be directed towards the formation of an erect and strong tree. Subsequent pruning should aim at directing the leaders and thinning out

\* Though published in 1929, this has only just come to hand and an abstract is given owing to the scarcity of literature on the subject and the interest of the particular article.—ED.



the crowded lateral growths in the centre. An appreciable number of almonds should be gathered about the 5th year from planting and thereafter yields should increase until in the 10th or 12th year a good average is reached. Enemies include parrots, cockatoos and crows, black aphid of the peach, the brown mite (*Bryobia pratinensis*) ; shothole fungus (*Clasterosporium* sp.=*Coryneum* Oud.), Prune rust (*Puccinia Pruni*). Harvesting and drying need care. The author gives descriptions of some 8 locally raised seedlings, which can be traced back to the Spanish hardshelled so-called Jordan strain (viz. Brandis, The Chellaston, White Nonpareil, Riverside Peerless, Jose's B1, Stockham Papershell, Johnson's Prolific), and of 4 types introduced from California which show great promise, viz. Hatch's Nonpareil, I.X.L., Ne Plus Ultra, Harriott. Tables are given showing the observed behaviour and cropping of a large number of varieties under 3 conditions, namely heavy rainfall, i.e. 31 in. at Blackwood orchard, of good, deep soils of the hotter, drier coastal country receiving 21 in. of rain in the Adelaide Plains, and lastly of the hot dry atmosphere obtaining at the Berri Experiment Orchard, where the annual rainfall of 10-11 in. is supplemented by irrigation.

### VEGETABLE GROWING.

358. HIBBARD, R. P.

635.64-2.111.3

#### The various effects of frost protectors on tomato plants.

*Michigan State Coll., Agr. Exp. Sta. tech. bull.* 124, 1932, pp. 36, bibl. 15.

Tests with a variety of covers were carried out in the seasons 1925-31 inclusive on tomatoes grown on high ground at East Lansing. The protectors fell into 4 groups, (1) paper, (2) cellulose compounds, (3) glass, (4) cloth. The protectors were in the form of cones placed over the plants. Many of the cellulose compounds went off the market owing to their excessive cost. The data obtained showed that while air and soil both absorb heat more rapidly under plant covers, outside the protective effect was less due to the check on radiation losses than to the provision of a higher maximum temperature on the previous day, from which descent begins. Under certain covers growth is apparently not checked, under others, notably those which restrict the light, it may be temporarily checked. The growth of unprotected plants was generally seen to be inferior to that of the protected when the covers were finally removed, but in two or three weeks distinction was difficult. Similarly plants, which had suffered from partial etiolation under cover, in two or three weeks after removal of the covers resembled the other plants. As regards air temperatures under the covers, at times these approximated with the outside temperature and at other times they varied widely. The material forming the cover appeared to exert an influence. At minimum temperatures no cover appeared to have an advantage over any other. Studies of soil temperature were also made. After a loss of heat differences between soil and air temperatures under protectors were found to be smaller than they had been during the absorption period, the reverse of the case outside. In general the air lost more and the soil lost less under protectors. In reviewing results it is considered that protectors were of undoubted value in one year out of six when unprotected plants were killed, of doubtful value in two, and no value in three. There has been an increase in total yield where they have been used, but in these cases it should be noted that the weather also was favourable. Glassene, a lightweight translucent paper, and others like it gave the best results in earlier maturity, higher yield, and less loss of fruit from frost at the end of the season. Their liability to storm damage is a disadvantage. In conclusion it is advised that only those growers who are close to a market and can secure the best prices should use these protectors. On the whole it is considered that it would be cheaper to raise twice as many plants as required and replace losses rather than incur the expense of protectors in seasons when they show no profit.

359. MOEN, O. 635.1/6-1.4  
 Orienterende prøver med dyrkning av endel grønnsaker på ulike jordarter.  
 (Yield tests with vegetables on different soil types.) [Norwegian-English  
 summary.]

*Reprint from Meldinger fra Norges Landbrukshøiskole, 1932, pp. 26.*

The tests were carried out in 1921, and in 1925-30. The soil types were (1) coarse sand; (2) stone mixed with gravel; (3) loam; (4) clay; (5) silty soil; (6) clay, sand and mould mixed. (1) Sand gave an early matured crop and the extra warmth of this medium produced quick early growth. Parsnip and parsley gave better crops in sand than in other media. (2) Gravel had much the same effect as sand except that the root crops were somewhat distorted, but still remained quite suitable for home use. (3) Loam gave the best all round results and its moisture retaining capacity enabled germination of seed to continue unchecked. (4) Heavy clay is unsuitable for a number of plants. However, rutabaga, beetroot, and tomatoes grew normally. Scorzonera, peas and beans did better in clay than in any other soil type. It can also grow large onions. (5) Silt is colder than other soils but retains moisture well. It grew some of the best cabbages. Unexpectedly onions grew larger in silt than in sand. (6) The mixed soil was fairly heavy and since it did not produce any notable results either good or bad it can be classed as good medium. The average soil temperatures during two summers at a depth of 15-20 cm. was—sand and gravel 15.1° C., clay 14.4° C., mixed soil 14.1° C., mould 13.9° C., silt 12.0° C. The value of the soils however could not be correlated with their warmth; for instance mould though colder than clay is certainly more productive, and even the cold silt gives better results. The tests are being continued owing to the many interesting results obtained.

The following is also noted:—

PLATENIUS, H. Carbohydrate and nitrogen metabolism in the celery plant as related to premature seeding. *Cornell Univ. Agr. Exp. Sta. memoir 140, 1932, pp. 66, bibl. 51.*

360. BECKETT, E. 635.8  
 Mushrooms.\*  
*J. Roy. Hort. Soc., 1932, 57 : 340-6.*

This paper, though directed primarily to the amateur, contains details of essential cultivation practices of the utmost value to the commercial grower. Very roughly speaking the conditions which should be copied are those of an English September night when mushrooms grow so well in the fields. Thus old cellars, railway arches and sheds all offer promise for adaptation. The only piping desirable is a four-and-a-half inch hot water pipe for raising the temperature in an emergency. In severe weather the temperature, which should rule between 55°-60° should never rise above 65°. It can normally be raised to the required level by spreading fresh horse manure in the pathway of the house and turning it once or twice a day. High temperatures mean poor quality mushrooms and rapidly exhausted beds. Instructions are given for making the beds from horse droppings and short stable litter. The water content of the mass should not exceed one third, a rough test by hand being possible. Excellent spawn can be bought in the form of bricks or fibre packed in cartons. The method of breaking up the spawn and preparing a case for it on the beds is described. The ideal medium is said to be old pasture top-spit, finely chopped up, and rubbed through a sieve and preferably steam-sterilized before use. Failing this a light, sandy loam of friable character should be used as less likely to contain harmful matter than richer soil. As regards watering the ideal condition is one that permits a certain slight evaporation from the soil. Beds should be watered during the summer by frequent sprinklings, which usually need to begin only when the crop begins to appear. To maintain

\* For further information on Mushroom growing reference may be made to the Ministry of Agriculture's bulletin 34 of 1931. Ed.



supplies beds should be made up and spawned at intervals of 2 to 3 months. They usually come into bearing from 6 to 8 weeks after spawning. Beds can equally well be prepared in the open, provided plenty of material for covering in cold weather and shelter to protect from excessive heat are available. The three worst pests are noted as slugs, snails and wood lice.

### FLOWER GROWING.\*

361. BARTON, LELA V. 635.936.751-1.531.16

**Effect of storage on the vitality of delphinium seeds.**

*Contributions Boyce Thompson Inst.*, 1932, 4 : 141-53, bibl. 13.

The writer's material consisted of two-year-old, one-year-old and fresh seeds of annual and perennial delphiniums. It was found that the viability of seeds stored in sealed vials exceeded that of seeds stored open and it is recommended that sealed containers should be a primary consideration and that these should be stored in a cool place. Storage at 8°C. and -15°C. were found to ensure the continuance of viability better than storage at room temperature. Germination tests at the outset, and after 16, 35 and 39 months indicated that a constant temperature of 15°C. and a daily alternating temperature of 10° and 20°C. during the germination tests were most favourable for germination.

Seeds of the perennial plant deteriorated more quickly under bad storage conditions than did those of the annual.

362. HITCHCOCK, A. E., AND OTHERS. 635.944-2.184

**Effect of illuminating gas on the lily, narcissus, tulip and hyacinth.**

*Contributions Boyce Thompson Inst.*, 1932, 4 : 155-76, bibl. 5.

This paper describes the effects of illuminating gas on the growth and flowering of the lily, narcissus, tulip and hyacinth. Ethylene as being the most effective injurious constituent in illuminating gas was used in some cases. Concentrations of illuminating gas ranged from 1 to 75 to 1 to 40,000. Time of exposure varied from 1-7 days. All four were retarded in growth without death or abscission of the leaves at all concentrations. The amount of response of leaves was on the whole much greater in young than in old leaves, varying also with rate of growth and variety of plant. It took such forms as curling, looping, double-bending, etc. and most of these persisted after removal from gas. As regards flowers, young flower buds of the lily, narcissus and tulip were killed by concentration of 1 to 10,000 and higher. Medium-aged flower buds were usually injured but not always killed. Flower buds of hyacinth were not killed by high concentrations, but if partly coloured at time of exposure to gas they were injured.

The following are also noted :—

MINISTRY OF AGRICULTURE & FISHERIES. **Carnations.** *Advisory leaflet 130*, 1932, pp. 4. A leaflet on the growing of "Tree" or "Perpetual Flowering Carnations" in England.

LAURENCE, W. J. C. **The origin of the garden Dahlia.** *John Innes Hort. Inst. occasional publication*, 1932, pp. 8.

BLAUW, A. H., AND OTHERS. *Temperatuur en Strekkingsperiode van de Narcis—I. (Temperature and stretching period of the narcissus—I.)* [English summary 1½ pages.] *Mededeeling No. 35 van het Laboratorium voor Planten-fysiologisch Onderzoek*, Wageningen, pp. 10.

BRIEGER, F. *Hyazinthen und Tulpen. Sammelreferat. (A review of genetic work on hyacinths and tulips.)* *Züchter*, 1932, 4 : 137-47, bibl. 27.

\* See also 316, 317, 321, 322.

## CITRUS AND SUB-TROPICAL FRUITS.

363. TASSINARI, G., AND OTHERS. 634.3(063)  
 Il convegno agrumario di Messina. (The Messina Citrus Congress.)  
*L'Italia Agricola*, 1932, 69 : 583-632.

The editor, Tassinari, actually only writes the foreword, but the following papers appear in full: Problems of citrus exports by G. Jung; Compulsory control measures against citrus scale insects by A. Drago; Price levels of citrus essential oils by G. de F. Gerbino; Citrus growers' associations and their work by D. Guzzini; Notes on citrus problems, being a summary of the opinions expressed by the National Fascist Confederation of Agriculturists on these problems in 1931. The papers are on the whole of a somewhat general character but show the resolute way in which the problems confronting the Italian citrus industry are being examined and approached under the Fascist régime. The keynote of the paper is the necessity for standardization of production so that markets may be won and held. Thus at a time when various parts of the British Empire are increasing their production of citrus fruit and looking for fresh markets, one of the oldest citrus producing countries is putting her house in order.

364. BLANCHARD, V. F. 634.3-1.542  
 Training young citrus trees.  
*California Citrograph*, 1932, 17 : 455, 470-2.

This paper is written to suggest that the method of pruning young lemon trees at present in use in Ventura county, California, has an adverse effect on yield. The method is to cut back the upright growing shoots to 8-15 inches. New buds developing from the cut ends develop either into vigorous shoots or fruit wood: these shoots are in turn cut back as before, a few being removed to avoid density of growth. It is asserted that, though strong trees are thus developed, these have proved by experiment to be slow in coming into bearing, and dwarfed in size. Two experimental plots were started in 1925 and '26 of 42 and 12 trees respectively. In each plot one half the trees were pruned on the system described above; the others were pruned as follows. Four or five upright shoots were selected as leaders to become the framework of the tree and were maintained by cutting off competing shoots, or the shoots can be used as horizontal fruit wood by bending or changing their direction. As much leaf should be left on the tree as possible, and, except for keeping the centres fairly open, pruning out of small branches should be avoided. There should be practically no cutting of lateral or low branches. If the fruit is heavy on the leaders while still young, it should be thinned to avoid breakage. If weight of fruit causes a main limb to grow in a horizontal position, it can be replaced with a new shoot from the leader close enough to give it support, and this shoot will eventually develop into a good leader. As the trees grow older the leaders should be kept upright with horizontal branches developing from them, which will provide good fruit wood without causing a congestion of the branches. When the tree begins to decline through age, a severe pruning and the elimination of weak growth may be used to restore it. In examining the results of this experiment it was found that during the period 30th October 1930 to 23rd September 1931, lemons pruned on the "thinning" system advocated here averaged 36,120 per acre as against 12,684 per acre for the old heading system; the difference in the returns at the current market price would be an additional 859 dols. per acre in favour of the thinning system. Suggestions for training oranges are also given but not in this case supported by figures. The methods advocated are the selection of 4 to 5 upright shoots from the branches to form leaders, an operation which, owing to the habit of the tree, is not possible till the third or fourth year. At first the trees will appear irregular but they will afterwards fill in. From the fourth year onwards it will then be necessary to cut out inside fruit wood which may be weakened or killed through shading. The tree should be kept moderately open, but emphasis is laid on the need for leaving the utmost amount of foliage possible.



365. READ, F. M. 634.3-1.42

**An investigation of the non-thrifty condition of citrus trees at Tresco.**

*J. Dept. Agr. Victoria (Australia)*, 1931, 29 : 551-72, bibl. 49.

This paper discusses the possible reason for the poor health of the citrus trees on the Tresco Settlement which is situated in the Mallee 8 miles from the Murray River and 14 miles south of Swan Hill. Of the 2,500 acres planted in 1913 only a few hundred remain productive, the trees on the remaining acreage being either in very poor health or dead. The trouble was evident within 5 years of planting and since then the trees have been gradually eliminated except from a few localities. Investigations revealed 3 soil types of the same class but varying in texture ; the decline in the health of the trees increased with the heaviness of the soil. A local and temporary free water table within a few feet of the surface, due to faulty irrigation combined with an impervious subsoil, is associated with trouble on many groves. A concentration of chlorine in the ratio of 30 parts to 100,000 of dry soil is held to be inimical to citrus trees in this district and this concentration has been found on most groves. At 20 feet the chlorine concentrations had increased to 200-500 parts per 100,000. It is considered, however, that an adjustment of irrigation methods would eliminate danger from deep saline layers. Routine soil analyses could disclose no differences between good and bad groves sufficient to account for the poor condition of the trees. The pH concentration is high and has a possible bearing on the trouble but no definite relationship is apparent. In their replaceable bases the three soil types differ markedly. The good soil is associated with relatively high calcium especially in the root zone (50-75%) and relatively low sodium content. The poorest soil is associated with relatively low calcium and very high sodium (30-62%) content. In the intermediate soil type calcium and sodium values are between the two extremes, but magnesium is much higher than in either the better or poorer soils. It is concluded that the impermeable character of the subsoil on the medium and heavy soils is due mainly to their high content of replaceable sodium. Experiments on reclamation have been initiated as a result of this investigation and will be subsequently reported. The paper concludes with a discussion of certain aspects of citrus nematode (*Tylenchulus semi-penetrans*) infestation. Their relation to tree health is still obscure.

366. MORENO, A. A. 634.31 : 575.252

**La variación en los naranjos y la selección de injertos. (Variation in orange trees and bud selection.)**

*Agricultura (Madrid)*, 1932, 4 : 617-20.

Attention is called to the considerable degree of variation even in the different parts of a single tree proceeding from one single bud ; reference is made to variants such as the Washington Navel, which have entirely superseded the original, and to a number of other interesting variants described in recent publications of the United States Department of Agriculture. In continuation, emphasis is laid on the care which must be devoted to bud selection to avoid perpetuating one of the less desirable variant types, a few of which are described and illustrated.

367. WILLIAMS, R. O. 634.323-1.541.11

**The programme of citrus experiments of the Department of Agriculture, Trinidad.**

*Trop. Agriculture*, 1932, 9 : 301-6.

The two principal problems are (1) the selection and preparation of suitable planting material for grapefruit and orange cultivation, (2) the best orchard treatment for grapefruit. To study this a series of 8 experiments have been arranged and are described. The stocks to be used in the trials are Sour Seville, the common sour orange of the West Indies, with a greenish yellow, acid pulp ; Sweet Seville, having a pleasant but bitter flavour, with orange coloured pulp,

Rough lemon ; " Wild " grapefruit, the last named being seedling trees which bear oval, seedy, dry fruits and are found scattered among other cultivations. Scions have been supplied by recorded trees from another experiment. Except in experiments on cultural and manurial treatments the soil treatment will be uniform. The lay-out of the experiment is on modern statistical lines. In this article each experiment is described in detail and illustrated with a plan of the lay-out. Briefly they are : No. 1. Trials of the relative merit of the above stocks for grapefruit, both varietal and between selected parent trees. No. 2. Disease resistance of stocks as varietal groups and individuals. No. 3. Height of bud insertion for grapefruit in connection with resistance to gummosis. No. 4. Root selection, to acquire data as to the effect of different tap roots on aerial development of grapefruit trees, i.e. straight roots, crooked roots, benched roots. No. 5. Cultural treatment, i.e. cutlassing, tillage, green manuring, cover cropping. No. 6. Manurial treatments. No. 7. Trials of stocks for oranges. No. 8. Height of bud insertion for oranges and relation to gummosis.

368. WEBBER, H. J. 634.337(79.4)-1.541.11

**The lime in California.**

*California Citrograph*, 1932, 18 : 19, 32.

The lime plantings in California are still very limited. It is of importance to find the most suitable rootstock for limes for the district and a discussion of the subject forms the major part of the paper. Near Tutsin a plantation of Bearss lime on sour orange appears in excellent condition but is showing marked overgrowth of the stock by the scion, similar to that which has so injured lemons on sour orange. Elsewhere other younger limes, both Mexican and Bearss are at 3-6 years already showing this overgrowth though otherwise in good health. At the Riverside Citrus Experiment Station buddings from the same selected Mexican lime trees were made on sour orange, sweet orange, rough lemon and trifoliolate, and two of each example planted in 1929. Of comparable size when planted, the trees on sweet orange and rough lemon have greatly exceeded in growth the trees on sour orange and trifoliolate. The trees on sweet orange and rough lemon are much alike in appearance. As far as knowledge goes at present, rough lemon would seem to be the most desirable stock particularly for the Mexican lime, as it may tend to increase the size of the fruit, which is desirable. Sweet orange stock may be the best for the Bearss lime as possibly tending to reduce the size of the fruits which are now too large. Trifoliolate should be ruled out owing to the large overgrowth of the scion by the stock. The susceptibility to gummosis diseases of the rough lemon and sweet orange must be taken into account, but in the dry climate of California this is not considered to be a serious matter. Brief notes on planting spaces, markets, pests and diseases conclude the paper.

369. GREEN, F. MARY. 664.85.31 : 632.48

**The infection of oranges by *Penicillium*.**

*J. Pom. Hort. Sci.*, 1932, 10 : 184-215, bibl. 43.

The old conception that infection of oranges by *Penicillium spp.* depends on luxuriant growth of the inoculum is shown to be incorrect by the author. She finds that *Penicillium* when grown in orange juice or rind yields a resistance-destroying system which can break down the outer rind's resistance to infection. Juice and rind from a recently rotted orange enable infection of sound fruit to occur. Such infection takes place naturally by contact. An old mouldy orange does not in itself cause infection of sound fruit. The exact processes by which *Penicillium* infection is achieved are discussed. A final conclusion is reached that all other conditions influencing decay are subservient to the two following master factors : (1) the degree of pectic resistance in the outer rind and (2) the activity of the resistance-destroying system which is produced by *Penicillium* on a mouldy orange but not in synthetic media.

370. DAVIDSON, J. 634.31-2.1/7  
**Some observations on the causes of the surface blemishes of oranges in South Australia.**

*J. Dept. Agr. South Australia, 1932, 35 : 1381-7.*

As the result of the investigations which were undertaken by the Waite Agricultural Research Station and are described as preliminary the rind blemishes can be divided into three categories, (1) mechanical injury by wind, (2) insect damage, (3) oleocellosis. (1) A small mechanical injury when young may have developed into a large blemish by maturity. Even the persistent light rubbing of a leaf over the very tender skin of a young orange may produce a faint superficial blemish. To protect against this type of mechanical injury the trees should be "brushed out" of dead wood and twigs, etc., so situated as likely to damage fruit, bearing in mind that the position of the fruit changes as it grows in weight. Other instruments of mechanical damage are hailstones and wind borne sand particles. The establishment of wind breaks is suggested for exposed positions, provided this did not create a "local climate" in the grove favourable to pests or diseases. (2) Insects are responsible for occasional rind blemishes, but the idea held by growers that thrips are to blame could not be supported on the season's observations. There was no insect visitation of sufficient severity to warrant the expense of control measures. (3) *Oleocellosis* is the name given to the toxic effect on the neighbouring cells of oil liberated from damaged oil vesicles. Definite blemishes from this cause in S. Australia were difficult to recognize and more research is needed. It is a form of blemish well known in California and S. Africa. Damage from the association of fungi or bacteria with blemishes was not dealt with.

371. PREST, R. L. 634.3-1.547.6 : 547.314.2  
**Colouring mature citrus fruits. Acetylene gas treatment.**  
*Queensland Agr. J., 1932, 38 : 290-1.*

Certain varieties of citrus fruit are at their best when still green, though of full maturity. The green colour gives a false impression of unripeness and reduces the market value. To counteract this acceleration of colouring by means of various gases has been contrived. Here a simple method of using acetylene gas is described. Though any wood-lined airtight room is suitable, on a commercial scale a chamber having double walls insulated with sawdust, an airtight door and a draught port on the opposite wall should be constructed. A room of 250 c.f. capacity is convenient and will hold 50 bushel cases. On a larger scale two medium rooms are better than one big one. An average temperature of 75° F. is satisfactory: below 65° F. the process will be retarded. Higher temperatures up to 89° F. do not affect the fruit adversely. The humidity must be adjusted, a dry atmosphere being moistened by standing water in bowls; when the humidity is high it may be reduced by placing sand, caustic soda and quicklime on the floor of the chamber. [The optimum degree of humidity is not mentioned. In Florida, using ethylene, as high as 92 per cent humidity is considered allowable, but the colouring room temperatures are higher (80°-90° F.) than recommended here. -ED.] The apparatus may be of the simplest, merely a vessel containing water which is allowed to drip on the carbide, either inside the room or outside with a rubber tube connection with the interior. The dosage is 1 part gas to 1,875 air, or up to 1 in 2,500 calculated for the air space remaining after the chamber has been filled. To calculate air space, allow 1½ c.f. displacement for each bushel case. One ounce of carbide generates enough gas for 75 c.f. air space. From 9-15 charges should be given, the charge lasting for 4 hours with a thorough airing of two hours between the charges. The average cost of colouring by acetylene gas under Queensland conditions is ¼d. a case.

372. WINSTON, J. R. 634.3-1.547.6 : 547.313.2  
**The colouring of mature citrus fruits with ethylene gas.\***  
*Citrus Industry, 1932, 13 : 9 : 6-7, 13 : 10 : 6, 30, 34 and 13 : 11 : 6-7, 31, 34.*

This article contains notes on the construction of colouring rooms, and instructions for their efficient working under Florida conditions. The air temperature of the room should be below

\* See *H.A.*, 1932, 2 : 3 : 279.



90° F. and above 80° F., the optimum being 85° F. for most kinds of citrus. The reaction of no two crops is alike, growing conditions having a marked influence on colouring. In general however, the temperature of the fruit should be raised to about 85° F. within a few hours after placing in the colouring room, at a rate not exceeding 5° per hour. This has usually to be done through the medium of steam, which also increases the humidity and prevents wilting. The temperature of the fruit varies with the time of day it is picked and whether it is growing in sun or shade, differences of up to 15° F. being found between field boxes. Damage is caused not by the ethylene gas but by the rapid aging brought about by the high temperatures used. It should be the aim to get the fruit through the colouring rooms and into colder surroundings (i.e. refrigerator or northern climate) as soon as possible. During cold weather a badly constructed colouring room will colour the top fruit at normal speed while the fruit in the lower part of the room may remain up to 48 hours without change. The liberal use of live steam in conjunction with dry heat from the steam radiator coils will counteract this and prevent the wilting due to the already low humidity of the cold air being increased by warming. If the fruit is wet from the steam, it should be dried after a few hours by reducing the live steam and therefore the humidity. In hot weather when temperature is high and humidity low, a water spray furnished with a mist nozzle should be used. An ordinary water main pressure will restore correct humidity in a short time. The gas is turned on when the room is filled with fruit and left on until colouring is complete. It is used at the rate of about 3 or 4 cubic feet "per carload room per day." The minimum satisfactory dose is uncertain. As regards the air introduced into colouring rooms the author stresses two points as essential:—(1) An abundance of fresh air is the only insurance against excessive decay, and (2) the fresh air must be conditioned to bring it to the proper temperature and humidity before it reaches the fruit. Low humidity ages the fruit and predisposes it to "gas burn" and other undesirable conditions. Excessive humidity is conducive to decay and tends to make the fruit lose its stem buttons. The optimum range is 85-92%. Ventilation which is essential must be carefully regulated. It can be given by opening a vent on the suction side of the blower, or better the side ports opening into the air-conditioning chamber can be used. On an average with the larger, multivane fans with 2 speed motors which are in common use a fresh air intake aperture of some 6-8 sq. in. for 1-car rooms (about 2,500 cubic ft.) suffices when the fans are run at high speed. Naturally many factors influence the ventilation necessary, e.g. size of room, gas tightness of room, speed and size of fans, etc. Over ventilation is undesirable. It is found that green oranges at the beginning of the season will take 48-60 hours to colour, while those picked later may need 36 hours or less. Grapefruits require about 12 hours less than oranges. The time required depends on variety and quality of fruit, weather and equipment. Common errors noted are:—judging of room temperatures merely by that in the top fruit; insufficient humidity at outset and for first few hours; misreading of the hygrometer [the author notes that an approximation to the relative humidity may be got by taking the difference of the wet and dry bulb readings, multiplying by 4 and subtracting the product from 100.—Ed.]; bad regulation of ventilation; attempts to rush the process. When fruit is properly handled throughout, little if any increase in decay within a reasonable time for marketing and consuming results from the process. Usually colour can be improved, and stem-end decay greatly reduced by giving the fruit a borax bath before colouring. The "Trickle" method is advocated. The author ends with a note of warning that fruit colouring is a technical process needing the undivided attention of some competent person.

373. PARSONS, T. H. 634.3/4(54.8)  
 The cultivation of fruits in Ceylon with cultural details. III. Group C.  
 Mid-country wet zone, 1,500-4,000 ft.  
*Trop. Agriculturist*, 1932, 79 : 86-90.

Grapefruit (*Citrus maxima* var. *uvacarpa*). In Ceylon 4,000 ft. appears to be the highest limit of successful cultivation. A rainfall of 60-120 inches per annum is suitable. Below 60 inches irrigation becomes necessary. At the other extreme careful attention must be paid to drainage. The rootstock here recommended is seedling grapefruit. The usual size of the stock for budding

is when its thickness at 5 inches above ground is about equal to that of a lead pencil. Recent experiments at Peradeniya, however, have produced excellent results with larger stocks, the bud being inserted in an inverted T, at 12-15 inches above ground. It is claimed that this method produces a more uniform standard among the trees and encourages a more rapid growth. Among varieties Marsh's Seedling has so far produced the best fruit in Ceylon. Other cultural operations are then described; these follow the normal procedure. *Brazil Cherry* (*Eugenia Michelli*). Other names for this *Eugenia*, which is one of the best, are Pitanga, Cayenne Cherry, Florida Cherry. It is cultivated on a large scale in Brazil, where it is indigenous and also in Florida, India, S. China, Hawaii and the Mediterranean coast. The fruit is suitable for jellies, preserves, stewing and also for dessert. A light sandy loam is preferable, though the tree is very adaptable. The most usual method of propagation is by seed, though whip grafting is recommended. From seed the fruiting stage is reached in 4 or 5 years. When in bearing, however, the crops are heavy and two a year are generally obtainable. The tree suckers freely from below ground and these must be removed at the base. Ample water is essential when the fruit begins to change colour, otherwise it will not swell. Pruning beyond the usual thinning of crowded branches is not required, though, if occasion arises, the tree will stand heavy pruning. *China Guava* (*Psidium Cattleianum*) also known as Calcutta Guava, Strawberry Guava, and the Hill Guava. This is the most palatable of the guavas and can be eaten raw, besides being much used in making of preserves. In Ceylon two crops a year are produced. Propagation is by seed chiefly, as variation in this variety is slight. Other methods are by cuttings or by budding on the large yellow-fruited guava. The tree resents transplanting and is, therefore, best raised in pots in the initial stages.

374. PARSONS, T. H. 634.16/571(54.8)  
**The cultivation of fruits in Ceylon with cultural details. Group D. Mid-country, semi-dry zones, 2,000-4,000 ft.**  
*Trop. Agriculturist*, 1932, 79 : 149-54.

**Loquat** (*Eriobotrya japonica*). Being a native of China and Japan the mid to high elevations are most suitable. At lower elevation the tree grows well but does not fruit freely. Propagation is usually by seed, but owing to variation marcotting or inarching is desirable. Budding on the seedling loquat is also successful. The seedling stocks are raised in nursery beds and are budded at the age of 12-15 months by which time they will be about 10 inches high. Both the inverted T method or a patch bud are suitable. The Japanese use quince as a rootstock for loquat, owing to its fibrous roots affording easier transplanting, but it is not considered in Ceylon that transplanting the loquat on its own root system presents any difficulty, and the quince is not well suited to Ceylon conditions. Imported plants are usually on quince and should be propagated on the loquat stocks as soon as possible. The budwood should be young smooth growth from which the leaves have dropped and the bud shields should be large, at least an inch in length. It is recommended that the top and bottom of the shield should remain tied even after the buds have taken, otherwise, as in avocado and mango, the bark may open round the bud shield. Pruning should be done to admit light and air after each crop. The young crop should be thinned as soon as the young fruits have set, as the tree easily overbears to the detriment of the fruit. *Citrus* varieties for the home garden are next dealt with. Commercial growers are referred to the *Department of Agriculture Leaflet No. 59. Litchi* (*Nephelium Litchi*). A plant indigenous to the south of China. Mid-country elevations having a somewhat dry climate are the most suitable, since, though it will grow well in wetter districts, it requires a dry period during the period of flowering and fruit setting. Propagation can be effected by marcotting, layering and inarching, since cuttings root badly and seedlings not only take at least seven years to fruit but are very variable. For marcotting or layering the selected branch should be approximately three-quarters of an inch in diameter and the cut should be made on a well-ripened section of wood. For inarching the stock should be a seedling 1½-2½ years of age from selected fruit. The seeds do not remain viable if not sown within a week, though they will remain so in the fruit for a month. The diameter of the stock to be inarched should be about half an inch at the base. It will take from 3-6 months to unite with the stock.

## TROPICAL CROPS.

375. LEAKE, H. M. 333.5

**Studies in tropical land tenure.**

*Trop. Agriculture*, 1932, vol. 9.

This interesting series traces the history and development of the past and existing systems of land tenure in the various tropical countries. Up to the present, tenure systems in the following countries have been dealt with: India (pp. 244-9, bibl. 4), West Indies (pp. 272-6, bibl. 6), Malaya and Ceylon (pp. 320-5, bibl. 8), East Africa (pp. 346-50, bibl. 11).

376. ANON. 633/635

**Recent research on Empire products. A record of work conducted by government technical departments overseas. Agriculture.**

*Bull. Imperial Institute*, 1932, 30 : 318-49.

Research on a wide range of agricultural subjects is reported. We mention here only those with which this Bureau is concerned. *Ceylon*.—The following plants were recommended by the Systematic Botanist to be grown on the Iranamadu land to prevent soil wash by wave action: *Tamarix gallica* L., *Parkinsonia aculeata* L., *Vetiveria zizanioides* Stapf, *Saccharum spontaneum* L. These will withstand occasional partial submergence. A list of 18 species is given suitable for the prevention of wind and rain erosion in a normally dry district. The list includes *Mimosa pudica* L., *Tephrosia purpurea* Pers., *Sansevieria zelandica* Wills. The relative susceptibility of local banana varieties to Panama disease is under investigation. Infection of plants grown under favourable conditions occurs but the disease then only progresses slowly. (The citrus rootstock trials at Peradeniya Botanic Gardens are dealt with in No. 419 of the present number of *H.A.*) A manurial trial of ginger on modern field experimental lines has been laid down by the Department of Agriculture. Trials of different manures on *Hevea* now in their second year all gave significant increases over the controls, 2 lbs. per tree per year of sulphate of ammonia proving the most satisfactory. Double this amount produced a less satisfactory result, while the addition of muriate of potash or superphosphate to the 2 lbs. sulphate of ammonia dose was no improvement. *Nigeria*.—Experiment has shown that the weight of wet cocoa beans per pod falls from the beginning of the main season, reaching half its original value at the end of the period. The weight of a pod cannot always be relied on as an index to the beans therein. Large pods from some trees often contain less than small pods from another tree. These facts are of importance when it is necessary to reduce the yield in terms of a number of pods to one of wet beans. Often factors to be investigated are the percentage and seasonal variation of dry to wet cocoa for individual trees. The period of delivery of the crop is important, a tree giving a crop that can be harvested at one time being preferable to one producing small quantities throughout the year. Coffee variety trials are in progress from seed obtained from Java and Gold Coast. A marketable coffee which will grow on the widely extending Benin sands is much to be desired. Citrus rootstock trials are in progress; budwood of improved varieties is being imported. Thirty-six acres of oil palm for experimental purposes are now planted, and observations on leaf and flower production have begun. Individual tree yield recording with kola has been begun at Ibadan and elsewhere. Experiments on root pruning, ring barking and open pruning on poor bearing trees are in progress. *Uganda*.—Shea Nuts. *Butyrospermum Parkii*. A good stand of young plants has been obtained at Serere Experiment Station. Observations on 6 adult trees (all available) showed an average yield of 156 seeds per tree which is uneconomic. It also revealed that the crop was not an annual one and that birds did considerable damage to the pericarp of the fruit. *Dominica*.—The lime breeding work has reached a stage when 18 hybrids of proved high resistance to disease have been back-crossed with the West Indian lime as male parent. The resulting seedlings showed very little polyembryony. *Antigua* and *St. Kitts-Nevis*.—Variety and spacing trials with tomatoes are being carried out.



377. GEORGI, C. D. V., AND TEIK, G. L. 632.951.1 : 581.192

**The rotenone content of Malayan tuba root (*Derris*).**

*Malayan Agr. J.*, 1932, 20 : 498-507, bibl. 11.

The value of *Derris* as an insecticide appears to depend according to recent investigations by the U.S. Dept. Agr. on the presence of an appreciable proportion of a substance called rotenone. In this connection research has been initiated in the S.S. and F.M.S. to ascertain which species of *Derris* contains the highest proportion of rotenone and the most suitable methods of cultivation and harvesting. The method of analysis is described. The results of analysis of commercial samples show wide variations of rotenone content, this being due to the commercial consignments consisting of different species of *Derris* of varying age. The species which offers the best possibilities as so far determined in these investigations is *D. elliptica*. There is a great difference both in rotenone content and in amount of ether extract between the erect and creeping varieties of this species, the only outward difference being the habit of growth, the erect variety being much superior. It is therefore necessary to exercise great care to ensure that the right variety is being planted. A similar difference between erect and creeping varieties is observed in *D. malaccensis*, the other common species in Malaya. The roots of this variety, however, contain very little rotenone. Until further investigations have been made, the amount of the rotenone content must not be taken to indicate the degree of toxicity. The latter can only be determined by controlled tests on different classes of insects, which tests are in fact now about to be carried out by the Malayan Dept. of Agriculture.

378. GREENE, R. A. 633.529.1.797

**Composition of the pulp and seeds of *Adansonia digitata*.**

*Bot. Gaz.*, 1932, 94 : 215-9, bibl. 6.

Though various investigators have discussed the uses of the fibre of the baobab the only study of the composition of the fruit, so far as the author is aware, is that made by Pelly in 1913.\* The results here given agree with the analyses of Pelly. The author's summary continues: "A feed analysis shows that the seeds have a composition similar to the seeds of *Chenopodium album* or a mixture of mesquite beans and pods. About 50% of the pulp is soluble in water. Reducing sugars, acids, proteins, and ash comprise about one half of their amount; the remainder is probably chiefly pectic substances. Neither the pulp nor the seeds gave tests for starch. The principal protein of the seed is a globulin, which apparently has never been isolated before. The tree has an economic significance since it furnishes food to carry several species of *Dysdercus* (Cotton pests) through periods when cotton seeds are not available."

379. DEINUM, H. 633.683-1.56

Producten van den sagopalm. (**Products of the sago palm.**) [Short English summary.]

*Landbouwe*, 1932, 8 : 105-42.

The paper deals with the sago palm in the Moluccas and gives an account of the local manufacture of its products. Four main varieties are distinguished, that most usually found being *Metroxylon longispinum* Mart. The palm is generally found wild in sufficient quantity to supply local needs. It reproduces freely from underground root runners, forming whole sago-woods. Propagation for cultivation if required is effected by means of these runners, which must be planted, but not deeply, in a moist sunny situation. After care consists of an occasional weeding. When the palm is about to flower (in from 12-18 years) it is cut down for use. The correct time for cutting is determined by experimental incisions in the stem. If the flower cluster has reached maturity, the sago will be too coarse to be used for all purposes. The primitive processes of

\* Pelly, R. G., The composition of the fruit and seeds of *Adansonia digitata*. *Jour. Soc. Chem. Ind.*, 1913, 32 : 778-9.

extracting and preparing the sago are described, as are methods of preparing foodstuffs from the flour. Among the by-products are the larvæ of the beetle *Rhynchophorus ferrugineus* F. which are considered a delicacy. To obtain them the tops of the felled palms are left on the field and visited in about a month after felling, when the larvæ will have reached a suitable size. An edible fungus also grows on the debris resulting from the sago extraction. Several ways of cooking this are described. The economic aspect of sago as affecting the Moluccan islanders is discussed.

380. STEINMANN, A. 633.72(51)  
De hedendaagsche theecultuur in Zuid-China. (Modern tea cultivation in S. China.)  
*De Bergcultures*, 1932, 6 : 1027-30.

In 1867 China possessed 90% of the world's tea trade, in 1924 she retained but 2.68%. While increasing competition from other countries undoubtedly played its part, the loss of trade would have been greatly minimized, had the Chinese proved capable or willing to make use of modern methods of cultivation and preparation. In this paper Dr. Steinmann describes the conditions found on a visit to a tea plantation in the Tsing-Yuen district on the slopes of the Pi-ka hills. The estate was situated at 600 ft. above sea level. The manager who was also the proprietor had no idea of the area of his estate or of the number of trees thereon. Other owners also were found to be ignorant of these points. The plantation was interspersed at irregular intervals with closely planted clumps of *Pinus Massoniana* used for firewood. The soil is stony and the surrounding vegetation consists of grass and bracken. The plant used is indigenous to the district. Seed for sowing is harvested in August and sown with the rains in February, in the interval being left in the sun to dry. The seed is sown where the bush is to stand, 3 or 4 seeds being sown in each hole, to ensure a result. The first picking takes place when the plant is three years old. The succeeding plucking routine is as follows. Two pluckings in April, prune in May, rest till August, 3 pluckings in August, rest in September, 3 pluckings in October, prune and rest till April. The first plucking in April and the first in August consists of the young buds from the axils of the leaves giving the best quality tea; the second plucking 10 days later is of shoots of 3 leaves giving a second quality tea. Growth during the rest period after pruning in May to August is from 3-5 inches. As rain is considered to impair the quality of the tea, picking is only done on dry, warm days. In the evening of the picking the leaves are placed without previous withering in iron trays over a fire, and kept there till soft enough to roll (in about half an hour). Rolling is done in the palm of the hand after which, as the author observes, the leaves assume a darker tint. Final drying takes place partly in the sun and partly in the trays. [Full translation available.]

381. PRILLWITZ, P. M. H. H. 633.72-1.415:581.084.1  
De invloed van den basentoestand van den grond op de ontwikkeling van de theeplant. (The influence of the degree of saturation and the pH of soils on the growth of young tea plants.) [Short English summary.]  
*Archief v. d. Theecultuur*, 1932, No. 2-3, pp. 122, bibl. 81.

The methods used for the analysis of the soils is first discussed. An adequate description is given in the summary. All pot experiments were carried out at Buitenzorg, the soils being obtained from different estates. The pots were kept in natural conditions under light shade. The soil in the pots was mixed with lime or sulphur powder in various quantities to obtain different degrees of saturation and pH. They were sown with tea seed after two or three weeks. At the conclusion of the experiment the height, leaf weight and root weight of each plant were determined. Briefly expressed the results were as follows. Lime manuring had no favourable effect and decreased growth in proportion to its concentration. There was a noticeable increase in undeveloped seeds and in the numbers of plants dying in the pots containing lime. Sulphur increased growth and plants growing in sulphured soils were well developed in all respects.

When lime and sulphur were mixed growth was stimulated only when this resulted in increasing the concentration of hydrogen-ions in the soil and diminishing the degree of saturation. The beneficial effect of sulphur manuring is due to increase of H-ions and the decrease of the exchangeable bases in the adsorption complex: there are also secondary results such as changes in physical and chemical conditions of the soil. The best results were obtained by the addition of sulphur till a pH  $\pm 4$  of the soil suspension had been reached. From this, however, it should not be definitely concluded that pH  $\pm 4$  of the soil suspension is the optimum condition for the growth of young tea, since according to the results of Aslander's waterculture experiments the influence of H-ion concentrations on the development of different crops is dependent on the concentration of the solution. Soils having a high exchange acidity (KCl solution) do not seem to decrease the development of the tea plant. That estates having such soils do show a very low yield must be due to their poorness and unsuitable physical condition. It is pointed out in conclusion that these experiments are concerned only with young tea plants and that bearing estates may have different requirements.

382. WELLENSIEK, S. J. 633.72-1.542.27  
 Selectieve uitdunning bij thee. (Selective thinning out in tea.)  
*Reprint De Bergcultures*, 1932, 6: 225-8.

Two experiments are described in which the results of selecting inferior tea plants for thinning out by eye and by exact yield are compared. The selection by eye was done by the author and A. J. Garretsen. Four pluckings were found by experiment to give an exact enough idea of the yield. It was found that selection by eye was quite unreliable, being only 30% in agreement with the exact yields and of this it was found that 15% was due to chance. However, the application of yield determination as a basis for thinning out is impossible over a large area, if only on the grounds of expense, so that an impasse arises. The solution would appear to lie in the planting of selected material only which would not later need selective thinning out. At present, such material is not in being. An interesting observation made in one of the experiments was that tea plants growing on the borders of the plantation averaged a 50% higher yield than those in the centre.

383. PRILLWITZ, P. M. H. H. 633.72-1.8  
 Bemestingsproeven bij de Theecultuur. I. Proeven op jongvulcanische  
 gebergtegronden. (Manuring experiments in tea cultivation. I. Experi-  
 ments on young volcanic mountain soils.) [English summary.]  
*Archief v. d. Theecultuur*, 1932, No. 1, pp. 32.

A total of 7 experiments was carried out on 5 estates. Results for the different estates on which the trials were made were not uniform. Thus, while on three estates manuring with sulphate of ammonia gave a satisfactory increase in yield, on the fourth, on soil from the volcano Merbaboe, sulphate of ammonia and other manures had a relatively poor effect. Similarly, manuring with potash gave no reliable improvement of yield in four cases out of seven. Generally speaking in contradistinction to manures containing nitrogen (in ammoniacal form) phosphatic and potassic manures gave little or no increase of yield. It is considered possible that better results may accrue from these so far unproductive manures after repeated applications. On all the experimental plots the soils are moderately acid (pH 5-6). The physical nature of the soils is good, but the amount of available water rather low. Manuring will not lower the susceptibility to *Helopeltis* attack but affected gardens recover more quickly when manured. It is suggested that in gardens subject to regular attack the plants should be manured directly they start to recover from the attack rather than after pruning.



384. HOLLAND, T. H.

633.72-1.874

**A trial of *Indigofera endecaphylla* in tea at Peradeniya.***Trop. Agriculturist*, 1932, 79 : 155-60.

JOACHIM, A. W. R.

***Indigofera endecaphylla* as a conserver of the fertility of tea soils at Peradeniya.***Ibidem*, pp. 161-5.

In 1925 at the Experiment Station, Peradeniya, twelve half-acre tea plots and two 1-acre plots, on which a manurial trial had just been concluded, were all planted with *I. endecaphylla*. No change was made in the manurial treatment, plucking or pruning methods. The object of the experiment was to determine the influence of any of the cover crop on the health or yield of the tea. The soil conditions throughout were also studied. There being no proper control plots comparisons were made between the yield of the period 1923-5 (without cover crop) and the succeeding 2-year periods 1925-7, 1927-9 and 1929-31. Cultural operations were reduced to a minimum. The cover plant was cut and rolled back to the side of alternate rows to admit of the annual application of manures and of the pruning mixture every two years. After the first 2-year period all but two plots showed an increase in yield, while in 1929-31 the highest yield was 57% and the lowest 12% above that for 1923-5. The exceptions were a plot under dadaps unmanured except for pruning mixture where the *Indigofera* grew sparsely, this showing a decrease of 2%, and a plot under *Albizia* on which *Indigofera* had not been planted. This latter plot is one of the best plots on the station and had received in parts various manures during 1927-9. It showed for the period 1927-9 a decrease in yield of 21% in comparison with the control period. Thus the only two plots to show a decrease in yield were those on which the cover crop was not thriving or was missing. The general appearance of supply trees growing in *Indigofera* is superior to those in clean weeded plots. In the early stages of the establishment of the cover crop weeding is more expensive, but as the cover becomes thicker the weeds are controlled with a consequent reduction of weeding costs. Couch grass, however, cannot be controlled by this cover crop, at any rate in places where it has already got a hold. In the matter of soil improvement, since the employment of the cover crop the plots have shown a steady increase in nitrogen and organic content. The cover appears to be effectual in preventing the erosion of large quantities of clay and silt, though there appears to be a slight infiltration of the finer soil particles. Sand and gravel are on the whole well retained.

385. FERWERDA, F. P.

633.73-1.531-1.541

**Enten versus zaaillingen bij Koffie. (Grafting versus seeds in Coffee.)***De Bergcultures*, 1932, 6 : 629-44.

Serious attention in Java was first paid to the grafting of coffee in 1896. It was regarded as a possible way of escape from eelworm attack then very severe in Arabica coffee. The stock used was *C. liberica*, a species which is comparatively immune. Interest in grafting waned, however, with the introduction of Robusta coffee, which is quickly raised from seed and has considerable immunity to various diseases. At the present time for one reason or other grafting is again coming to the fore and the lecture is concerned with a discussion of its merits and demerits as compared with the usual method of propagation by seed. Advantages of grafting are:—Uniformity in growth and habit.—Less variability in yield as between individual trees. (A diagram is given to show that in a certain seedling plantation under investigation 75% of the total yield was supplied by 47% of the total number of trees. It took therefore 53% of the total number of trees to supply the remaining 25%.)—The ripening period is more defined in grafts than in seedlings, a fact which leads to economy of labour in harvesting and to control of diseases and pests attacking the berries.—The possibility that by means of highly resistant rootstocks plantations can be laid out on infected land.—The possibility of perpetuating a desirable variety. —The power to transform a poor orchard into a better one by topworking the existing trees.

Dealing with comparative yields it is shown by diagrams that, while seedling crops fluctuate from year to year, those of comparable grafted plantations are more regular; nevertheless, over a period of years the average yield of the grafts is considerably, i.e. 60%, lower than that of the seedlings, even when the grafts are taken from particularly good parent trees, while the compared seedlings are from unselected stock. A discussion on the reason of this phenomenon follows. The low yield of grafts is proved not to be due to the effect of the rootstock, since, although incompatible rootstocks exist, the incompatibility results in a general illhealth of the tree, while on the flourishing grafted trees where the stocks and scion are obviously compatible the poor yields are the same. It was noticed that grafted trees in mixed associations always bore well. Tests showed that the yields were not inferior to comparable seedlings. A series of experiments in pollination revealed that Robusta coffee was self sterile. It became obvious, therefore, that large plantations of grafted plants derived from a single clone would be naturally inter-sterile. This conclusion was emphasized by the fact that the boundary trees of grafted plantations, where those plantations joined others of different descent, would bear well, while the interior of the plantation would have but a poor crop. An instance is then given of plantations containing grafted plants interplanted either with seedlings or grafted plants from different clones, and these bear as well or better than a comparable seedling garden. The conclusions drawn are :—

1. The laying out of large single-clone plantations is inadvisable.
2. Productive grafted plantations can be made by interplanting different clones or by leaving groups of seedlings standing in the case where an existing plantation is top grafted.
3. It cannot at present be asserted that grafted plantations will yield more than seedlings, but the advantages of uniformity in various directions coupled with the fact that the produce usually commands better prices makes the method worth while.
4. Certain hybrid varieties, which are particularly fitted for districts where the standard sorts do not flourish or which have other desirable qualities, can only be propagated by grafting.
5. The question of the most suitable rootstock needs investigation. Not only does Robusta often fail on Excelsa stock, but certain Robusta clones do not succeed on Robusta stocks. [Full translation available.]

386. GILLETT, S. 633.73-1.532/5  
**Vegetative propagation. Its value in the improvement of permanent crops and the possibilities of its application to coffee.**  
*Kenya Dept. Agr. bull.* 19, 1932, pp. 8, also included in *Kenya Dept. Agr. publication*, "Papers read at the coffee planters days, 1932."

The advantages of vegetative propagation to the grower and research worker are first outlined. The following methods are being investigated at the Scott Agricultural Laboratories. *Hardwood cuttings.* In soil and in sand in artificial heat. Rooting has not been achieved; there is slow callusing and good aerial growth. Success is considered improbable. *Softwood cuttings.* Success here is inhibited by fungus attacks. Trials with sterilized soil are now in progress. Temperature, watering, drainage and light intensity are important factors for success or failure in softwood cuttings. *Etiolation of sucker growth.* The suckers are produced at the base of a tree which has been cut back to near ground level. When 18 to 24 in. high they are ring barked near the parent stump. The stump and suckers are covered with a debbie (4 gall. petrol tin) open at both ends which is then filled up with earth. The suckers callus well. It now remains to be ascertained whether they will root from the callus while still attached to the stump or whether they should be removed and placed in a propagator. *Grafting.* Cleft grafting is the most successful method. The graft should be made on old brown wood. At the Scott Agricultural Laboratories the rootstock is prepared some days before use and is protected by a paper cover. The scion is not applied until the cut back stock shows signs of new growth. The most successful scions seem to be obtained from the first non-petioled bud portion of the tree or sucker. The grafts are bound with ordinary gummy twine. Cylindrical paper covers, tied at one end and dipped in paraffin wax, are used to shade the grafts until union has taken place.

387. SNOEP, W. 633.73-1.615  
 Verschijnenselen in een koffie-aanplant op veengrond. (**Phenomena observed in a coffee plantation on bog land.**)  
*De Bergcultures*, 1932, 6 : 687-91.

The plantation under discussion is in Java, situated in a basin bounded on three sides by steep hills. The soil profile from the surface downwards is as follows. The top layer, 10-15 cm. thick, consists of a rich vegetable bog soil mixed with clay from the drainage channels and detritus from the hills. The second layer, 50-60 cm. thick, is made up of partially decomposed plant remains practically unmixed with soil. This rests on a subsoil of considerable depth of soft blue-grey clay with an admixture of sand. The water table through an intensive drainage system is kept at a depth of 50 cm., nevertheless, owing to their absorbent nature the surface layers are so saturated that water can be squeezed out by hand, and the water in holes excavated for planting stands 10-20 cm. higher than in the adjoining drainage channels which may be only 1 cm. away. The drainage system consists of drains 2 ft. deep and 16 ft. apart (allowing of two rows of coffee to be planted in between) running into natural or artificial main drains. Water is never absent from the secondary drains even during the very pronounced dry season. There are 3 blocks of Robusta coffee A, B and C, 3, 2, and 1 years old respectively, growing without shade. The trees are characterized by exceptionally strong growth and appear from 1-2 years older than they actually are. The crop both for A and B is heavy, while C is already showing bloom. The extra vigorous vegetative development, it is suggested, is due to the unflinching water supply enabling the plant to maintain itself by unchecked transpiration in strong sunlight and so to intensify its nutritional processes. The heavy crops are attributed to the absence of shade and to the unusually quick carbohydrate formation in the presence of unstinted supplies of nitrogen. Under these conditions it appears that a rapid and vigorous vegetative growth may accompany an accelerated and vigorous generative development. There are signs, however, that these favourable results may be transient. In plantation A browning and withering of the leaves occurred at the beginning of the West monsoon, the size of the berries seems to have decreased though the yield is still very high, the berries are losing their typical shape and unripened ones show signs of shrivelling. In plantation B leaf scorch is visible and branches, probably owing to their abnormally rapid growth, are too brittle. An examination of the root system shows that all including the main roots are in the top 25 cm. of soil, the finer roots having developed into a thick felt-like mass. The deterioration which seems to be impending is here attributed to a disturbance of the balance consequent on the surface soil being completely filled with roots and the impossibility of development in a downward direction under bog conditions. The probable impoverishment of this limited soil area can also be considered as a factor. A remedy suggested is to bank the trees with soil excavated from the drains. This soil will gradually weather and so deepen the area available for roots. Deep cultivation where possible between the trees is advisable to admit air to the lower layers of the bog. [Full translation available.]

388. BECKLEY, V. A. 633.73-1.8  
**Some factors in the manuring of coffee.**  
*Kenya Dept. Agr. bull.* 16, 1932, pp. 8, also included in *Kenya Dept. Agr. publication*, "Papers read at the coffee planters days, 1932."

Poor soils in which the humus content is deficient require a proper selection and application of manures if satisfactory results from manuring are to be obtained. Prepared organic manures must first be used; green manures in these cases are inadvisable and may even cause dieback when turned under, unless a dressing of readily available nitrogenous manure is given at the same time. Failing this the competition for nitrogen by the bacteria responsible for the rotting may cause the coffee to suffer severely. When applying prepared organic manure it is far better to concentrate this in small pits dug near the tree. Experiment has shown that, while 5 tons per acre of well rotted manure spread over the surface and harrowed in failed to improve trees in poor condition, a similar quantity applied in pits effected marked improvement. When the



manure was spread there were but few fine feeding roots, but in the pits the whole mass of manure was filled with feeding roots. In succeeding years pits should be dug and filled on the other side of the trees and these gradually joined up with furrows 9-12 in. deep also containing manure, until a lattice work of rich soil is formed. It is stated that, in order to gain the same effect as that produced by 5 tons on the pit system, 20 tons of organic manure spread and harrowed would have been necessary. These suggestions do not apply to soils in good heart. In these cases the spreading method will maintain fertility. Artificial manures are next dealt with. Only purely nitrogenous artificials should be applied as a top dressing, phosphatic and potassic fertilizers should be turned under on application. The best time for turning in as regards coffee is still unknown, but the subject is being studied by the Scott Agricultural Laboratory. Probably in between crops shortly before rains will prove to be best. Artificial nitrogenous manures should not be given till near the end of the rains except in certain urgent cases, since they are so easily washed out of the soil. The downward movement of nitrates will then be somewhat balanced by an upward movement as the soil dries. However, slowly available nitrogenous manures such as bone manure, etc. do not suffer from leaching to the same extent and are the most suitable for a perennial crop.

389. CHEESMAN, E. E., AND POUND, F. J.

633.74-1.521

**Uniformity trials on cacao.**

*Trop. Agriculture*, 1932, 9 : 277-88, bibl. 7.

From uniformity trials on cacao based on data accumulated at River Estate by the Trinidad Department of Agriculture it may be concluded that :—

(1) In cacao reasonably homogeneous with respect to age, field experiments on a Latin Square lay-out with 12 to 18 trees per plot may be expected to demonstrate differences due to treatment of the order of 30%.

(2) Under similar conditions the use of two or three years' previous records of natural yield, applied by Sanders' method, may double the precision.

(3) Under some circumstances the combination of consecutive years in pairs may reduce the standard error as much as the use of regression.

(4) In cacao heterogeneous for age, field experiments cannot be recommended unless previous records of natural yield are available.

(5) The use of records for three years previous to the experiment may increase precision as much as eightfold, and thus bring within the bounds of practicability experiments on cacao heterogeneous for age. The precision, however, still remains below that obtainable with cacao uniform in age.

(6) The value of previous records varies with circumstances, and cannot be stated in general terms, because the inclusion of an abnormally good or an abnormally bad year among them may result in a loss rather than a gain in precision. [Authors' summary.]

390. WELLENSIEK, S. J.

633.74-1.547.4

**Bloembioologische waarnemingen aan cacao. (Flower biological observations with *Theobroma cacao* L.) [English summary.]**

*Archief v. d. Koffiecultuur*, 1932, 6 : 87-101, bibl. 16.

The investigations were carried out in Java. The author's conclusions from his own researches are as follows : The flowers open at 4.30 p.m. ; by 6.30 a.m. the anthers have opened and the pollen is ripe. Pollen will keep its germinating powers in closed glass tubes for at least 12 hours. Pollen removed from flowers which have been open longer than 1½ days fails to germinate. The flower is proterogynous, the stigma being ripe when opened. In Java pollination by insects has not been observed. [In Trinidad Cheesman says that pollination is effected by small

crawling insects such as ants and aphides, *H.A.*, 1932, 2 : 3 : 285, quoting Harland, *Ann. Appl. Biol.*, 1925, 12 : 403-9, in support.—Ed.] Cross pollination probably occurs only between flowers situated close together. The observations have led to the evolution of a method for artificial pollination in which the pollen flowers are picked in the morning and used for pollinating newly opened flowers at 7.30 p.m. the same evening. This method resulted in 3% of ripe fruit being obtained from 620 flowers while workers using the Bolt method only obtained a 2% crop.

391. POUND, F. J. 633.74-1.55  
**The fruitfulness of cacao : The significance of the relation between total variance and mean annual yield.**  
*Trop. Agriculture*, 1932, 9 : 288-90.

(1) It is found that in fields heterogeneous for type and age there is a very significant positive correlation between the mean annual yield in pods per tree and the total tree-to-tree variance.

(2) On statistical grounds this must be due to the fact that in good years the yield of good bearing trees draws far away from the yield of poor bearing trees. The proportionate increase of crop may possibly be about the same for all trees but in any case good bearing trees have a greater capacity for increase of yield than poor bearing trees.

(3) This contention is supported by the number of good and poor bearing trees occurring each year.

(4) There are two factors responsible for capacity to yield, the size and age of the tree, and its inherent capacity to produce fruit. Therefore, in selection on the basis of yield of pods alone, attention must be paid more to the number of pods produced per unit area of land than to the actual number of pods produced by the tree. [Author's summary.]

The studies leading to the above conclusions were made on a number of trees at River Estate, Trinidad. The trees on this estate have been recorded for many years.

392. ANDERSON, A. J. 633.81  
**Tonca beans in Trinidad.**  
*Proc. Agr. Soc. Trinidad and Tobago*, 1932, 32 : 270-5.

This article written by a grower of Tonca beans criticizes some of the statements recently published in the Proceedings\* (*H.A.*, 1932, 2 : 3 : 287) and adds further information. The editor of the journal points out that the writers of the two articles live at opposite ends of the island of Trinidad with very different soil conditions. The following points of particular interest are selected from the article. The seed for sowing must be matured on the tree and freshly collected. Damage by bats leads to a tendency to collect the seed before it is mature. The seeds must be set in the ground at an angle of 45 degrees, and very slightly covered in earth or dried grass. Germination takes 4-8 weeks. It may be necessary on germination after the radicle has entered the ground to remove the hard seed coat from the cotyledons. It is said that much seed has come to nothing from neglect to do this. The author disputes the statement in the previous article that Tonca beans from seed require 7-15 years to come into bearing. He considers that with proper cultivation, i.e. clean weeding for the first two years, and a little light forking round the tree in succeeding years the trees should bear in from 3-7 years. The impression that the tree crops only once in 3 years is thought to be incorrect. On the author's estate the oldest trees, varying from 12-18 years, were found to produce one full and heavy crop and in the two successive years to fruit on alternate sides of the tree. Size and quality of bean appear to depend on soil, age of trees and weather conditions. "Bloaters," i.e. inferior pods with smooth and swollen beans, are due to immature beans and water-logging and the percentage figures vary according to the number of good beans destroyed by bats. [The editor of the Proceedings adds a note disagreeing with this statement, believing from experience that certain trees produce these useless beans in large numbers, and that the trees themselves bearing "bloaters" have

\* *Proceedings Agr. Soc. Trinidad and Tobago*, 1932, 32 : 167-71.

physical peculiarities such as larger leaves which enable them to be distinguished from the trees bearing good quality beans.—ED.] In preparation for market the pod should be thoroughly sun-dried before removal of the kernel. The kernel itself must never be exposed to heat, artificial or otherwise. After removal from the pod it is only necessary to air the beans under shelter for about 48 hours immediately after extraction.

393. MOWRY, H.

633.85

**Variation in the tung oil tree.**

*Univ. Florida Agr. Exp. Sta., bull. 247, 1932, pp. 32.*

Initial plantings of the tung oil tree in Florida took place in 1923 and there are now some 10,000 acres under this crop, all the trees being seedlings. Even casual observation reveals tremendous variation, this being most obvious in the number, size and shape of fruits and in the single or cluster habits of fruiting. The work described in this bulletin was an attempt to determine whether certain variations were inherent or due to environment and, if the former, whether desired characters could be perpetuated by seed or vegetative methods of propagation. Twenty-three trees of the Station plantings were chosen for study, ten of them being about 18 years old and the others in their 7th, 8th or 9th year from time of planting. Analysis and observations were made on the 1931 crop only (except, of course, in the case of yield records) and included yield, fruit size and weight, number of seeds per fruit, number of seeds per pound, percentages of hull and of seed in the whole fruits, and percentages of kernel, oil and testa (seed coat) in the seed. The magnitude of variation found may perhaps be gauged by the figures for the 4-year yield of air-dried seed which varied in 18-year old trees from 21½ lbs. to 481½ lbs. and in 9-year old trees from 29 lbs. to 104½ lbs. per tree. Combining the variable factors in different trees it was found that the oil content per hundred pounds of their air-dried fruits varied from 17.04-24.53 lbs. While some of the variations noted were undoubtedly environmental, it was found possible to perpetuate certain desirable characteristics by budding. Moreover, on the two seedlings of known parentage under observation fruit characters were found to be closely identical with those of the parent, a phenomenon which appears to be in line with observations made in the field. Plantings have, moreover, now been made on a much larger scale to get conclusive evidence on the point. Meantime, in view of the tremendous existing variation, it is suggested that only seed from carefully selected parents should be used or that budding should be adopted.

394. FROST, E. T.

633.85

**The tung oil tree : cultivation experience in N. Auckland.**

*New Zealand J. Agr., 1932, 44 : 337-9.*

Some thousands of acres are to be devoted to the cultivation of the tung oil tree (*Aleurites Fordii*) in the N. Auckland Province. It is well to clean nursery ground a season before the seeds are sown, a crop of potatoes and subsequent stirring of the soil after harvesting the potato crop being suggested. The reason for this is that the tung seeds germinate irregularly and as much as 3 months may elapse before intercultivation can be safely done, so that, unless the ground is already clean, the weeds will be very troublesome to control without damaging the plants. Shelter is necessary as the tree is a rapid grower in the early stages, attaining a height of 2-3 feet within three months of germination and continuing to grow at the rate of 3 inches a week. The leaves at this stage will be 15-20 in number and 10-12 inches in length and in breadth, thus presenting a large surface to the wind. Later the leaves become smaller, but shelter is still desirable to prevent injury to the blossoms. Under congenial conditions of soil temperature the time for germination is about 45 days. A cold soil definitely retards germination, so that nothing is to be gained by early planting. A suitable planting distance in the nursery is in rows 3 feet apart with 12 inches between plants. This gives enough space for growth up to planting out size and leaves room for mechanical cultivation between the rows. About half a million young trees are now growing in nurseries in New Zealand and are soon to be planted out.



395.

ANON.

633.85

**Tung seed and oil from Empire sources.***Bull. Imperial Institute*, 1932, 30 : 271-82.

A report on samples of *Aleurites Fordii* products from Assam, Dehra Dun in India, New South Wales, Transvaal, Natal, Nyasaland, and on *Aleurites montana* seeds from Ceylon. [A report on *Aleurites Fordii* seeds from Kenya was published in *Bull. Imp. Inst.*, 1929, 27 : 10.—Ed.] The samples are compared with the results of a sample of *A. montana* from China. With one exception (Natal) the examination of the seeds was carried out by Dr. L. A. Jordan, Director of the Research Association of British Paint, Colour and Varnish Manufacturers. A detailed analysis is given of each oil. The general observations are as follows : *Assam*.—The oil is exceedingly pale in colour and in its chemical properties is on a level or even above the American product hitherto regarded as standard. It should have a profitable future if the standard is maintained. *Dehra Dun, India*.—The oil equals the best American in every respect except acid value and colour. These factors could be improved by adequate drying before shipment. *New South Wales*.—The oil should prove satisfactory for the preparation of ordinary tung products, although it failed to pass the tests of the British Standards Institution for refractive index and heat test. It is very similar in composition to the Chinese and American oils. *Transvaal*.—The oil satisfies the British Standards Institution tests and would be readily saleable. *Natal*.—The oil satisfies the tests of the British Standards Institution. *Nyasaland*.—The oil is of outstanding quality as regards colour and seed value, and is up to standard in all other respects. *Ceylon*.—(*A. montana*.) The oil is on the general montana level for which at present there is no standard specification. At present the oil is quite saleable, but attention is called to the probability that in the future the oil of *A. montana* may be at a commercial disadvantage as compared with that of *A. Fordii*. It shows admirable drying properties and may be regarded as a promising varnish oil.

396.

McCulloch, L., and Demaree, J. B.

633.85-2.314

**A bacterial disease of the tung oil tree.***J. Agr. Res.*, 1932, 45 : 339-46.

In view of the interest now being taken in the commercial possibilities of the tung oil tree attention is called to this newly discovered bacterial disease. The causative organism is provisionally named *Bacterium aleuritidis* n.sp. A description is given of the morphologic, cultural and physiological characters of the pathogene.

397.

Rolfes, P. H., and Rolfes, C.

633.85.26.42

A cultura da sapucainha. (*Carpotroche* sp.) (**Cultivation of the Sapucainha.**)*Secretaria da Agricultura de Minas Gerais (Brazil)*, serie Agricola num. 6, 1931, pp. 29.

The sapucainha (*Carpotroche* sp.) has been found to be a source of an oil having the properties of chaulmoogra oil, a specific for leprosy. It is indigenous to Brazil, and accordingly the authors undertook a series of cultivation trials with it. Hitherto there were scarcely any plants in cultivation, the oil already in use among the peasants being obtained from wild plants. For the purposes of the experiment which was started in 1927 at the Agricultural College seedlings were raised from seed collected from one tree (hereafter known as No. 1). Germination was only 16%. [It may be noted that in the wild trees, however, a germination of 20% is considered above normal.—Ed.] The young plants when large enough were removed from the seed beds and planted out, a ball of soil being left on the roots. In a number of cases the ball was accidentally knocked off the roots without, however, in the least affecting the subsequent growth of the plants. All transplants were heavily shaded but not watered at the time as the soil was already moist. The planting was done in the first days of March. Hot weather in May caused wilting and water was then given. Some of the young trees began to fruit when  $3\frac{1}{2}$  years old. As, however, wild trees are known to bear very irregularly, it was considered that budded plantations would be a necessity. Accordingly a number of these young plants were worked with buds from tree No. 1 (of which they themselves were the seed progeny) taken from various

positions, the tree being dormant at the time. The results were considered to be promising in view of the fact that for experimental purposes the sapucainha buds had been taken from various parts of the tree and placed in various positions on the stocks. It was found that all the successes were obtained when the budding was done on the younger, chestnut-coloured wood as opposed to the older ash-coloured portions, the best time being when the stock was just starting into fresh growth. The only method of budding used was the T shield method. Experiments were made in heading back the stock after budding. Whether this was done close to the bud, or away from it with and without the upper leaves, appeared immaterial. The experiments are being continued. [Full translation available.]

398. HOLLAND, J. H. 633.854  
**Oiticica** (*Licania rigida*).  
*Kew Bulletin*, 1932, No. 8, pp. 406-11, bibl. 7.

For some years nut kernels under the name of Oiticica have been appearing in small quantities on the London market. Owing to lack of material it has only recently been possible to identify the tree producing these kernels as *Licania rigida* Benth (*Rosaceae*), a native of N.E. Brazil, growing to a height of about 45 ft. and in habit somewhat resembling the mango. The kernels contain on an average 63 per cent of oil. Chemical experiments conducted by Bolton and Revis recorded in *The Analyst*, July 1918, pp. 251-3, "all tended to show that this oil has very remarkable properties, which place it in a distinctly unique position and there is every reason to suppose that the oil is worthy of the attention of the varnish maker. . . ." Compared with tung oil, which it seems to resemble, it has a higher density, a lower refractive index, a slower heat polymerization and gelation and a somewhat similar smell. It has a high oxygen absorption relative to linseed oil. The smell indeed is characteristic, heavy and overpowering, so much so that in the early days a factory at Ceara had to stop production, because of it. There is evidence that the Administration of the State of Ceara consider this oil to be of future commercial importance, since the new industry has been exempted from taxes and duties for 10 years, and the felling of oiticica trees has been prohibited. At present there is no information of the rate of development of *Licania rigida* under cultivation. Germination of seeds imported to England has been very uncertain.

399. ANON. 633.912  
**Rubber production in the temperate zone.**  
*India-Rubber J.*, 1932, 84 : 18A : 29-32.

A brief account of some of the research undertaken since 1871 in an endeavour to find a rubber-producing plant suited to a temperate climate and capable of being used as a source of commercial rubber. Although many temperate plants produce rubber, none of them so far have been made to do so economically. In U.S.A. during the war when there was a possibility of the imported rubber supply drying up it was estimated that *Chrysorhamnus nauseosus*, the rabbit bush of California, would yield 300 million pounds of rubber if necessary. The rubber from this plant had long been known under the name of chrysil, but hitherto had been found impossible to exploit commercially. However, the emergency did not arise and the investigations lapsed. Other plants noticed in this article are *Asclepias* (about 8 species), *Picradenia floribunda* (the Colorado rubber plant), various species of *Euphorbiaceae*, *Sonchus oleraceus* (the sow thistle), *Lactuca virosa* (a variety of lettuce grown in the Moselle district), *Abrotailis gummiifera* (the Sicilian artichoke), and the Chinese tree tu-chung, *Eucommia ulmoides*. The recent Russian and American schemes for local rubber production are not discussed.

400. ANON. 633.912-1.458  
**The problem of exhausted rubber lands in Ceylon.**  
*India-Rubber Journal*, 1932, 84 : 12 : 7.

This note is a summary of a discussion at a recent meeting of the Estates Products Committee of the Ceylon Board of Agriculture. There are, it was said, large acreages of land in Ceylon planted with rubber which would never again have a competitive value in the market. Some

of these lands were already exhausted when the rubber was planted, having for years previously carried crops of tea and before that coffee. On other lands rubber had been planted without reference to climate and elevation and these proving unsuitable had failed. The question arose, "What crops could be grown on these derelict acres?" It was considered in discussion that the possible crops fell into two classes, those which would require removal of the existing rubber trees and those which did not. In the latter class the pepper vine with the rubber tree to act as a support was suggested. The cultivation of this vine however is said to be slow and the percentage of failures high. Suggestions for other crops, which would probably necessitate the removal of at any rate part of the rubber trees (though this is not stated in the report) are *Derris malachensis*, used in the manufacture of insecticides and *Croton Tiglium*, the source of croton oil. The normal price of seed of the latter is 30-40 shillings per cwt., the extraordinary price of 290 shillings per cwt. being due to a temporary fluctuation. *Aleurites montana*, the source of tung oil (not *A. Fordii* which is unsuited to the climate) was favourably mentioned. Its growth is very rapid. There is however no information as to possibilities of yield. Other crops suggested were caje nuts (= cashew nut, *Anacardium occidentale* L.) and balsa wood (*Ochroma lagopus* Sw.), timber of the latter being remarkable for its friction and sound resisting properties.

401. SHARP, C. C. T. 633.912-1.541.5  
**Some variations of budding technique on big stocks.**  
*J. Rubber Research Inst.*, 1932, 4 : 39-45.

The experiments here reported were undertaken to decide (1) whether the use of immature bud wood on large stocks would affect the normal percentage of successes; (2) whether an extension of the period beyond the usual 18-20 days before opening up the budding would result in a higher proportion of successes; (3) whether these departures from the normal practice would affect the rate at which the buddings would begin to shoot. The trees were growing on light sandy soil at the Experiment Station at Sungei Buloh and were 32 months old, their mean girth at the collar being 12.5 inches. The budwood cut at intervals throughout the day and used immediately was classified into 3 sections according to degree of maturity, namely, brown wood, intermediate wood, and green wood. The clones used were BD5, Avros 152, SR9, Avros 50, PB186. It was found that by increasing the period before opening from 18 to 23 days the percentage of success was increased from 69 to 82. No advantage was obtained by extending the period before opening to 28 days. Fully matured budwood gave a higher percentage of success than immature wood except in the case of BD5 when immature wood gave equal success. In Avros 50 and BD5 the use of green budwood is considered to have reduced the time before the buds shot. No reduction occurred with the other clones used. The opening after 23 days delayed the time of shooting but this delay did not counteract the advantage of the greater number of successes.

402. SCHWEIZER, J. 633.912 : 633.73  
 Over het opnoeien van Hevea in gemengde aanplantingen. (**Pruning Hevea**)  
**in mixed cultivations.**  
*De Bergcultures*, 1932, 6 : 857-60.

The practice of growing Hevea and coffee in conjunction is common, particularly when coffee prices are high and rubber low. The profits from the coffee will maintain the rubber plantation till such time as higher prices again place rubber production on an economic basis. In these cases the lower branches of the Hevea are removed to enable the coffee to obtain more light with consequent earlier and heavier bearing. This postpones the date when first tapping can take place on young Hevea, but hitherto information has not been available as to its effect on yield. An experiment made on the Soember Wadoeng Estate, Java, is here recorded, which beginning in 1928 and ending in 1931 showed that the effect of pruning the lower branches of Hevea to about 50% of the total amount of foliage on the tree resulted in reducing the yield to 74.4% of that of the control trees in the first year, but only to 92.8% in the year when the experiment ended. A graph shows the yield lines of pruned and unpruned control trees gradually approaching each other, and, had the experiment been continued, they would possibly have met, since



the pruned Hevea was compensating for the removal of its lower branches by vigorous crown development, and would soon have acquired the same or even a greater area of assimilation than before. The effect on the coffee was very striking. The plantations were thereby regenerated. The yield in 1931 was double that of the control, nearly equalling that to be expected from unshaded coffee, whereas in previous years the same comparison between shaded and unshaded was approximately as 1 : 3½. [Full translation available.]

403. CHEEMA, G. S. 634.1/8 : 658.8

**The marketing of fruits and vegetables in Bombay.**

*Dept. Agr. Bombay Presidency publication, 1932, pp. 17, bibl. 24.*

Dr. Cheema has studied on the spot the fruit and vegetable marketing organizations of London and Paris and here makes suggestions for the adaptation of the most suitable of their methods to Bombay conditions. In the course of the paper he gives an interesting account of the present methods of business in the local fruit and vegetable markets of his district.

404. ALDABA, V. C. 634.61 : 581.144.2

**On the growth of coconut roots.**

*Philippine J. Agr., 1932, 3 : 59-63 : reprinted in Trop. Agriculturist, 1932, 79 : 98-9.*

New roots of the coconut palm are produced above the old ones. These new roots are often exposed to the air by erosion due to the heavy rains, with the result that they become dry before they are able to reach the ground. Consequently the tree is dependent on the old roots already in the ground, and as these die off, its health suffers. It was found by experiments that covering the exposed and dried new roots with earth caused a renewal of growth, not at the original root tip but slightly behind it. It is realized that earthing up a plantation of coconut trees would be expensive and probably impermanent. As an alternative the use of coconut husks is suggested. These are usually piled between the trees and burned after each harvest or 3 or 4 times a year. They could therefore be utilized as a covering without extra expense. Experiments have shown that the husks so used will not form breeding places for the coconut beetle.

405. CORBETT, G. H. 634.61-2.7

**Insects of coconuts in Malaya.**

*Dept. Agr. S.S. and F.M.S., gen. series bull. No. 10, 1932, pp. 106, plts. 19.*

This work is the first of a series of manuals to be issued on the insect pests of the major crops of the Malay Peninsular. While not considering it complete the author has nevertheless described with illustrations no less than 79 major and minor insect pests of coconuts, giving notes on their life cycles, parasites and methods of control.

406. GRASOVSKY, A., AND WAITZ, J. 634.62(569)

**The date palm in Palestine.**

*Hadar, 1932, 5 : 177-81, 212-5, bibl. 5.*

The article opens with a slight historical sketch of the date palm in Palestine from the earliest times. Despite its fame in ancient times the present date palm population of Palestine is very small, numbering scarcely 6,000 trees, of which only 2,100 are of good quality, the remainder being seedlings which produce inferior fruit. *Yield.* Plants propagated from offsets begin to bear in the 6th year after planting, the maximum yield being attained when the tree is in its 40th year. The norm is reached in the 10th year. The two leading varieties in Palestine, "Hayani" and "Bint-Aisha," yield annually 8-14 bunches or 100-125 kg. and 4-5 bunches or 60-70 kg. respectively. *Climate.* Soft dates have been found to fruit only in areas where the mean temperature is not less than 21·1° C. for the months May to October. For packing varieties the mean temperature must not fall below 23·9° C. for the same period, and late packing dates require a temperature from June to August, of not less than 32·2° C. A knowledge of the heat requirements of the different varieties becomes of importance when importation of suckers

from other countries is under consideration. *Soil.* The most suitable is a rich, well-drained sandy loam. The tree will fruit if there is not more than 3% of alkali in the soil or up to 6 parts per 1,000 in the irrigation water, but alkali-free soil gives superior fruit. *Propagation.* Hitherto the mortality of the offshoots has been very high due to lack of knowledge on the part of the planters. Investigations still proceeding indicate that the conditions for success are as follows. A woody slow-developing offshoot is preferable to a tender green one; similarly palms not used to much water are the best for supplying the offshoots. Offshoots should be 1.5-2 metres in height, should weigh 20-50 kg., and be 2-4 years old. The offshoot should be separated exactly at the junction with the parent tree with a very sharp knife. After removal of side shoots it is placed in the shade to evaporate moisture (about 12%-15%). This slight evaporation, which must not be carried too far, will prevent fermentation after planting. Other methods are described whereby offshoots are induced to root before final planting, i.e. (1) earthing up the offshoot with good soil and manure to induce it to root before detaching it from the tree, (2) partially removing the offshoot and earthing up as in (1), and (3) planting in nursery beds having a bottom heat provided by hot water pipes. *Planting.* This is done preferably in spring. The offshoots are so planted that  $\frac{3}{4}$  of the crown remains above ground level and the heart is further protected from direct contact with irrigation water by a mound of soil, which is heaped round the shoot. Shade is given by wrapping the shoots in sacking or straw. Planting distance is 8-10 metres apart. *Cultural operations.* Irrigation to any amount may be practised, provided there is no standing water left afterwards. During blossoming in spring and ripening in autumn irrigation must be withheld. *Manuring.* In Palestine manuring of date palms is practised even when other fruit trees are left unmanured. The practice is to give 300 kg. of organic manure every two years. The manure is applied by filling two trenches on opposite sides of the tree with manure, and repeating this after a lapse of two years on the other two sides. Offshoots, of which some trees produce many, should in spite of their saleable value be restricted to 6 or 8 per tree. *Pollination.* This is done artificially by binding a few strands of flowers from a male tree to each female spathe as it opens. One male palm will thus fertilize about 50 females. The work cannot be done with success in cool or wet weather. Research is needed on such questions as the influence of pollen on the quality of the fruit. This influence is considered to be very great and it is argued that many male trees in Palestine are not the best possible and that others more suitable could be obtained. *Pruning.* The dried branches in older trees are removed and in humid districts in addition sufficient green leaves to expose the fruit and trunk fully to the sun. At least 40-50 green leaves must be left on the tree. *Harvesting.* The fruit stalks of the ripening bunches are bound to the branches above them to prevent breakage. Although fruit is occasionally picked unripe and ripened artificially the usual custom is to leave it to ripen naturally on the tree.

407. MAGEE, C. J., AND FITZPATRICK, A. L.

634.771/2 : 581.148.2

**Leaf-fall of bananas.**

*Agr. Gaz. New South Wales, 1932, 43 : 319-21.*

The name "leaf-fall" was applied to a condition appearing in relatively mature banana plants, generally those which had already fruited, in which a premature withering of the leaves in succession from the base of the plant upwards occurs. The first symptoms are the development in the laminae of water-soaked areas which have an oily appearance and are of considerable size. The areas enlarge, extending often from the midrib to the leaf margin, and later become brown and dry. Similar areas appear in the midrib and leaf stalks. Often considerable defoliation may occur. Inoculation with bacteria obtained from diseased tissues giving negative results, a physiological cause was suspected. It was noticed that the "leaf fall" only occurred on land which had been cropped for many years previously by sugar cane or grass, and it was thought that worn out soil conditions were responsible. A series of carefully controlled manurial trials resulted in leaf fall being very slight and in improved fruit on the manured plots, while the unmanured check plots were in poor condition. The manure consisted of 4½ lbs. per stool of a mixture of equal parts superphosphate, muriate of potash and sulphate of ammonia applied in October 1930, and January 1931.

408. WOOD, R. C. 634.771/3-1.8  
**Manuring bananas.**  
*Trop. Agriculture*, 1932, 9 : 352, bibl. 2.

Unthrifty banana plants at the Imperial College of Tropical Agriculture, which were going to yield no crop owing to environmental uncongenialities, were brought into luxuriant growth and bearing by the application per tree of (1) 200 lbs. synthetic pen manure and 1 lb. muriate of potash or (2) the same with the potash omitted. This equals 38 tons of pen manure and 435 lbs. of potash per acre. The manure appeared to act in this case largely by rendering the trees strong enough to resist the attack of the beetle *Tomarus bituberculatus* Beaud, which was found to have bored into and severely damaged the bulb of the unmanured trees. The manured trees also showed signs of beetle attack, but either were vigorous enough to resist it or were less palatable than the stunted trees, so that the beetle did not persevere. Photographs are given showing the great contrast between the manured and unmanured plants. Experiments are now being laid out to determine the exact value of potash to the banana plant.

### PACKING, PROCESSING, FRUIT PRODUCTS.\*

409. GREGORY, J. H. 588.427 : 631.56  
**Marketing passion fruit.**  
*Queenstand Agr. J.*, 1932, 38 : 43-61.

This paper gives directions for the harvesting, grading and packing of passion fruit. In hot weather the fruit should be picked when nearly fully coloured and placed in a shaded place to cool. In cooler weather the fruit may be allowed to colour fully before picking. In all cases picking should be done for preference in the early morning or late afternoon so that the fruit is not too heated, and close attention should be paid to the subsequent cooling. Stalks may be left on, but the dead part of a blossom which adheres to the end of the fruit is a source of mould infection and should be removed. The packing bench should be covered with sacking to protect the fruit from bruises and should be slightly tilted towards the packer so that the fruit will roll easily in his direction. The development of crinkling of the fruit after packing causes depreciation in market value and can be retarded by keeping the fruit in a cool, dark place. Three grades are recommended, "special," "standard" and "plain," these being terms actually applied to a number of other fruits and well understood in the trade. Four kinds of pack are described and illustrated by numerous figures, the half-bushel dump case 18"  $\times$  8 $\frac{3}{8}$ "  $\times$  7 $\frac{1}{8}$ " deep and 3-3 pack being recommended as suitable for all classes of fruit. Refrigeration is not altogether satisfactory, but with careful pre-cooling fruit should store safely for a month.

410. ASAMI, Y. 634.451-1.56  
**On the processing of Japanese persimmons with partial vacuum.**  
*Repr. J. Hort. Ass. Japan*, 1932, vol. 3, pp. 7, bibl. 5.

The fruit containers used were high pressure cooking kettles kept in an almost constant state of vacuum by pumping three times a day. Other fruits were kept for 6 days in sealed containers, so evolving a sufficient volume of CO<sub>2</sub> for comparing effects, while as a second control further fruits were subjected to 1 to 2,000 concentrations of ethylene. The results achieved in each case are detailed and the author came to the following conclusions: Evacuation for several days resulted in a more rapid loss of astringency than occurred in the control fruits. Fruits so treated did not become soft so quickly as those treated with ethylene. Partial vacuum tends to retard subsequent proper ripening in the same way but to a lesser degree than CO<sub>2</sub> treatment.

411. BROWN, S. G. 668.52  
**Notes on the production of essential oils, with special reference to Rhodesia.†**  
*Rhodesia Agr. J.*, 1932, 29 : 352-9.

The author stresses (1) the costliness of distilling plant; (2) the necessity for a large acreage to produce a little oil, e.g. 1 acre of geranium containing 10,000 to 15,000 plants will require

\* See also 395, 398.

† See also *H.A.*, 1931, 1 : 2 : 94.



cutting 2 to 3 times in a year and will produce some 20 lbs. of oil worth at present price about £16; (3) the fluctuation in market prices.

He gives an account of results obtained under his conditions with some nine or ten of the most important commercial sorts. Local conditions were: Altitude: 5,000-4,500 ft.; Rainfall: 44.43 ins.; Temperature range: 85-31°F.; Soil: light, sandy; Fertilizers: kraal manure, wood ash, distillation residue. Among cultural notes are the following: Geranium (*Pelargonium roseum* and *P. odoratissimum*). Propagation from cuttings 12-15 ins. long struck any time in the warm weather before the rains. Hand cultivation necessary 3 times during wet season. Excessive damp and white ants killed off plants after 1st year. No margin of profit. Lemon grass (*Cymbopogon flexuosus* and *C. citratus*). Propagation by division of roots. Needs replanting every 4 years and is an exhausting crop. Profitable only if found capable of smothering weeds and growing itself: *Citronella grass* (*Cymbopogon Nardus*). It does not need replanting every few years, but the price is less than that for *C. flexuosus* or *citratus*. The oils of Palmorosa (*C. Martinii* var. *Motia*) and Ginger grass (*C. Martinii* var. *Sofia*) both produce higher priced oils than Citronella and Lemon grass, but there is little demand for them. Peppermint oil (*Mentha piperita* and *M. arvensis*). Grown from suckers. Yield per acre should be 20-30 lbs. Under Rhodesian conditions dies down in a year. Citrus oils (*Citrus* spp.). Neroli is produced from the flowers and petitgrain oil from the leaves of the bitter orange. Both the juice and the rind of limes produce oils. The rind of the bergamot produces an oil and the fresh peel of lemons. All the above are good oils. Hurricanes in the West Indies have lately caused the price of oil of limes to soar. As a measure of productivity the author notes that 60 bitter orange trees in full bearing will produce 1 lb. of neroli. Eucalyptus oil (*Eucalyptus* spp.). The quality of oil produced in Rhodesia has not been equal to that of Australian oil. The price is low. Notes on distillation are given and the author estimates that for dealing with 400-500 acres an installation of 8 to 10 eight-hundred-gallon stills would be necessary at a cost of £1,500-£2,000.

412. PASCUAL, A. 665.327.3  
**Designation and grading of olive oils.**  
*Int. Rev. Agr.*, 1932, 23 : T.351-9. Reproduced in *Bulletin des Matières Grasses*, 1932, 16 : 289-97.

In spite of the superiority of its physiological and therapeutic qualities and food value the world consumption of olive oil is very low in comparison with that of food fats. An international classification and standardization of olive oils is required. This would certainly favourably influence the further development of their consumption and would ensure satisfactory industrial treatment of the oil. There follows an interesting series of reports from some of the principal olive oil exporting countries of the world detailing the measures taken by each to ensure as far as possible the purity of their oils. A study of these reports, it is remarked, will show the need for some universal standard of agreement for a uniform grading system.

The following is also noted :—

GEORGI, C. D. V. **The centrifugal extraction of palm oil at Serdang.** *Malayan Agr. J.*, 1932, 20 : 446-59.

## STORAGE.

413. HOCKEY, J. F., AND WARD, R. W. 664.85.11 : 632.952  
**Studies in apple storage. I. The influence of fungicides on flavour and sugar content.**  
*Scientific Agriculture*, 1932, 12 : 709-15, bibl. 6.

It has been noticed that bordeaux-sprayed fruit exhibited better storage qualities than lime-sulphur-sprayed fruit. This paper dealing with flavour and sugar content forms part of a general study of the effect of orchard spraying on the apple in storage. Other aspects will be

dealt with in later papers. The fruits used were Ribston, Northern Spy, Starks and McIntosh Red, selected for uniformity of size and colour and stored in a carefully ventilated room of the common storage warehouse at the Experiment Station, Kentville, Nova Scotia. There were three treatments common to all the varieties, bordeaux mixture, aluminium sulphate lime-sulphur mixture and lime-sulphur. In all four varieties bordeaux-sprayed fruit had the highest total sugar content. In Starks and Northern Spy lime-sulphur-sprayed fruit had a slightly higher percentage of sugar than that sprayed with aluminium sulphate or lime-sulphur mixture; in McIntosh Red and Ribston the reverse was more markedly the case. The control fruit (untreated) had a sugar content approximately equal to that of the lime-sulphur-treated fruits. It is realized that there are other factors which might influence the sugar content of apples such as leaf area, stock, fertilizer treatment, cultivation, and the position of the fruit stem on the spur. Here the possible effects of leaf area and position of fruit were not considered. All trees of the same variety had similar fertilizer and cultural treatment. They were on crab stock.

414. TILLER, L. W. 664.85.11 : 632.1  
**Influence of carbon dioxide on internal breakdown in the Sturmer.**  
*New Zealand J. Science and Technology*, 1932, 14 : 20-22.

The tests were made by the Cawthron Institute of New Zealand. The apples used (of necessity) were Sturmers which had already been in cold storage at a temperature of 38°F. for 11½ weeks. The temperature at which the tests were carried out was 35°F., this being the one at which New Zealand apples are transported to England. Strictly comparable fruit was placed in 3 gastight metal containers, 108 apples in each. The concentrations of carbon dioxide used were 0.4%, 5.0% and 10.0%, the remainder of the mixture being air. The precautions taken to ensure a maintenance of concentration at the required strength and technical details concerned with construction of the cylinder are described and the latter illustrated. The fruit was kept under these conditions at a flesh temperature of 35°F. for 4½ months. On examination it was found that there was a definite increase in the amount of internal breakdown due to the presence of carbon dioxide, the breakdown increasing with the intensity of the CO<sub>2</sub> concentration. It is concluded that even carbon dioxide concentrations well below the danger limit for the production of brown heart (10.0% according to Drs. Kidd and West, of Cambridge Low Temperature Station) should not be considered safe for long storage of fruit at low temperature. Tests are now needed over a two-month period corresponding to the length of the overseas transport period from New Zealand.

415. MULDER, R., AND SPRENGER, A. M. 664.84.64.037  
 Proeven met het bewaren van tomaten bij lage temperatuur. (**Experiments on the storage of tomatoes at low temperatures.**)  
*Laboratorium voor Tuinbouwplantenteelt, te Wageningen med*, 16, 1932, pp. 86, bibl. 6.

Results may be briefly summarized as follows. At 0°C. tomatoes in all stages of ripeness may be kept not longer than 5 days without damage, but at 7 days they begin to spoil. No increase of colour takes place in store and when removed to warmer temperatures the fruits are found to ripen more slowly than those that have not been subjected to refrigeration. At 4°C. the results are little different to those at 0°C. There is slightly more colouring but this shows an abnormal yellowish tint. Mould develops more quickly than at 0°C. At 8°C.-10°C. half-ripe tomatoes can be kept up to 14 days. At 12°C. and somewhat higher all tomatoes which have just a trace of colour can be stored up to approximately 4 weeks for the most unripe. The best packing for these longer storage periods is peat dust. Fruit so stored should be consumed or preserved within 3 days of removal from store.

416. ANON. 664.84/85(42)  
**The English fruit and vegetable canning industry.**  
*J. Min. Agr.*, 1932, 39 : 734-8.

The growth of canning in England is noted. The present consumption of canned fruits is 3½ million cwts. of which ½ million cwts. is now the contribution of English canneries. Before the

war the English production was practically nil. The number of fruit and vegetable factories has increased from 30 in 1928 to 40 in 1930, to 56 in 1931, to 68 in 1932. Most of these are in or near the main growing areas, namely Kent, Middlesex, Wisbech, S. Lincolnshire, Worcester-shire and Herefordshire. The kinds of fruits canned include plums, damsons, cherries and apples, strawberries, raspberries, loganberries, blackberries, gooseberries, black currants and red currants. Of vegetables the pea is much the most important, but beans, carrots, celery, new potatoes, turnips, spinach and beetroots are also canned. It is noted that not all the vegetables and soft fruits grown for the fresh fruit market are suitable for canning. A description of the processes of canning is given in general terms. Export trade is only in its infancy, but standardization of produce and the National Mark should do much to foster it especially within the Empire.

### NOTES ON BOOKS AND REPORTS.

417. SUDELL, R. 634/5(03)  
***The new illustrated gardening encyclopædia.***  
Odhams Press Ltd., 1932, pp. 1152, col. plts. 5, figs. 534, price 5s. for a limited period.

This new encyclopædia deals very completely with all aspects of gardening as practised in the British Isles. Each branch of horticulture has been written by a specialist in that particular line and can therefore be said to embody the most recent information available of practical value. In the fruit section emphasis is laid on the importance of the rootstock and the necessity for using only guaranteed, standardized material. The need of only planting interfertile varieties of fruits is pointed out and lists of these are given. A chart of cherry pollination trials is reproduced from the *Journal of the South-Eastern Agricultural College*, Wye, for 1931. In spite of its eleven hundred and fifty-two pages the book is easy to handle.

418. GOLD COAST. 63(66.7)  
**Recommendations concerning agricultural development and policy. Part A.**  
**Administration.**  
*Dept. Agr. Gold Coast, bull. 24, 1932, pp. 46.*

This bulletin is a report of the findings of the Departmental Advisory Committee of the Department of Agriculture, Gold Coast, at a meeting held in January 1932 to discuss major lines of policy. The bulletin throws a very interesting light on the local problems which beset the Administration. The committee has quite definite views as to how these problems should be tackled and each is set out together with the methods suggested for its solution clearly and with brevity. Perhaps the most important suggestion made is that itinerant instruction or the attempt to educate the individual native farmer (apart from schools, colleges and publications) is expensive and ineffective and should give place to legislation for which, after all, it is merely a substitute. The point is made that where government policy is fixed and definite it is always expressed by legislation, e.g. there is no provision for education in sanitary methods because these are enforced by law. It is urged that any Act of Government aimed at improvement or development of local agriculture should be defined and expressed in the form of legislation which should be enforceable by the Agricultural Department. A statement of matters on which legislation is considered necessary is then given. Other points discussed in the bulletin are :—The necessity for an investigation of the soils of the Gold Coast, little being yet known of their composition and agricultural characteristics. Local soil problems of which a list is given. The need for chemical work on local agricultural products. The need for an exhaustive study of the Citrus fruit piercing moths, of which four species are known, whose attacks cause heavy loss and unless checked will be a limiting factor in building up any export trade in Citrus. Other pests needing immediate study such as the cacao moth, cacao weevil and migratory locusts. An instructive account, particularly as regards local factors, of the recently initiated Agricultural Co-operative



Movement is given. The Movement is stated to have already proved its value and to be making good progress. The need for its extension wherever possible is stressed.

419. CEYLON.

633/635(54.8)

**Administration report of the Director of Agriculture of Ceylon for 1931, 1932, pp. 163.**

We quote from this report particulars of certain research work in progress during the period under review. *Coconut Research Scheme*.—Preliminary work was started on a newly acquired estate of 154½ acres. This included recording experiments on 300 trees, and germination studies. Attention is being paid to dry land cropping, though there are many difficulties. Suggested crops are tobacco and chillies, on which the Department is carrying out selection and drying experiments. Crops that are also being encouraged are ginger, turmeric and pepper. Trials are in progress of rootstocks for grapefruit in view of the fact that particular scions thrive best on different stocks under particular climatic conditions. Attention is called to the suitability of the American or Cuban shaddock (correct identification unknown), as a rootstock under Ceylon conditions. It is easily budded and makes remarkable growth. Stocks for grapefruit being raised for trial are grapefruit, seville orange, nattaran (a near relative of citron), siddaran [the botanical identity of these two last is still uncertain.—Ed.], *Citrus hystrix*, *C. megaloxycarpa*, *C. mitis*, *C. aurantifolia* var. and *C. Webberi*. Those not showing much vigour when budded are *C. hystrix*, *C. mitis*, *C. aurantifolia*, *C. Webberi*. The plantation of *Croton Tiglium* at Peradeniya suffered from a failure to mature a full quantity of good seed. Many empty and half empty pods were found. Since no fungoid or insect pest could be traced to account for this, it is suggested that the trouble may be due to imperfect fertilization owing to the male flowers appearing before the female. A row of trees pollarded to 7 ft. high in December 1930 yielded double the amount per tree of uncollarded trees. *Rubber*.—Two experiments to test the influence of scion on stock have been started. In one the object is to discover differences in yield of stocks raised from the seed of one mother tree and either (a) budded at 3 ft. from the ground with a high yielding clone or (b) not budded. In the other and probably more valuable experiment the influence of seedling stock should be eliminated. In this all the trees have been budded low down in the ordinary way with Avros 49. When the bud shoots are of sufficient size it is intended to bud half of them at 3 ft. with a proved high yielding clone and the remainder with buds from a known low yielding tree. *Mangoes*.—It has been found possible to improve the grafting and budding technique so that fair success can be obtained without resorting to marcotting or inarching. The stocks available are *Mangifera indica*, always used commercially, and *M. zeylandica* which is still in the experimental stage. Experiments are under way to test the suitability of the stocks to various scions. *Mangosteens*.—Rootstocks experiments with these have proved difficult. Mangosteens inarched on *Garcinia cornea* have not progressed; those inarched on *Garcinia cambogia* died after planting out. Seedling stocks of these two varieties and of the reputed drought resisting *G. Benthami* are being raised for further trial. Cherimoya (*Annona Cherimola*) have been budded on Soursop (*Annona muricata*) without difficulty. It is hoped that the use of a tropical stock may induce fruiting at a lower elevation than 4,000 feet.

420. RUBBER RESEARCH INSTITUTE OF MALAYA.

633.912-1.543

**The forestry system of rubber planting.**

*J. Rubber Res. Inst. Malaya*, 1932, 4: 54-64.

This article is an explanation and criticism of the "Birkmose" system of the cultivation of rubber under forestry condition. The natural balance of conditions in primeval forest, the original habitat of Hevea, is very different to the situation created by the clean weeding or prolonged cultivation and exposure of the soil in commercial Hevea plantations. Here the surface layer of the soil instead of being, as in the forest, of open texture, aerated, active and in possession of food reserves, is usually to be found depleted of its organic matter, lacking in bacterial activity, hard and dead. The Birkmose system aims at treating a stand of Hevea as natural balanced forest. To achieve this on an existing plantation the mere cessation of weeding or cover cropping is not sufficient. On the contrary there must be a careful selection of natural covers. Lalang

control is of course essential. Plants forming close mats or tufts are eliminated, as also is stag moss and similar plants whose roots are likely to have an acid reaction on the soil. Plants with broad leaves and soft stems are encouraged. The formation of woody growth except by the seedling rubber, which arises from the self-sown seeds of the older trees and will form the dominant species and crop producer of the future, is not permitted. The selective weeding is done by hand since the use of tools might lead to root injury and soil erosion. Plants removed from the soil are left to rot there, the process being accelerated by breaking up, by pressure and by the addition of lime. It is asserted that once these forestry conditions have been achieved the stand can be maintained permanently by replacement from the surrounding seedlings, this being done by judicious thinning. The selected trees can be budded and it is considered probable that an old stand could in this way in time be entirely replaced by buddings. A description is given of one of Mr. Birkmose's experiments whereby a hilltop of 8 acres of dying trees (10 years old, planted 15 ft. apart) was by this method in less than 4 years completely regenerated and producing 600-800 lbs. of dry rubber per acre per annum. The control plot of 3 acres still remains poor and unproductive. In discussing this system, which, subject to certain reservations, the authors of this paper view with considerable favour, it is pointed out that success so rapid as that achieved by Mr. Birkmose is not to be assumed in every case. The age of the trees, duration of period of deterioration, the nature of the soil profile, and the degree of soil exhaustion are all factors which will have a bearing on the problem. Nor must the system be regarded as an ideal plan for an immediate economy in labour and supervision. In the early stages it will need careful attention and add materially to the task of management. Later when the new forest conditions have become stabilized economies will naturally occur, and there is an added advantage that temporary neglect will not harm the established plantation. As the authors remark, the old method of plantation cultivation was simple but led to complications, whereas the new method is complicated to start with but leads eventually to great simplicity. However, there is one potential source of trouble whose power for evil under these conditions is not yet known, and that is root disease. It must be regarded as part of the forest complex and it is assumed by some that under the forestry theory it will not get out of hand, reliance being placed on the number of seedlings surviving owing to natural resistance. But the practice, by which old trees for removal are ringed and left to decay or else cut off close to the ground, will provide a permanent source of infection, and the authors feel that the proposal to abandon all systematic antiseptic or preventive treatment and to trust to nature to maintain a proper balance is at this stage, to say the least of it, incautious. If, however, particularly in new plantations the *Hevea* seedlings are regarded merely as ground cover and are eliminated before they are large enough to be pathologically dangerous (at a maximum growth of  $\frac{3}{4}$ " stem diameter), then the danger will be greatly reduced. [For a previous account of this system see *H.A.* 1932, 2: 1: 75.—Ed.]

421. MYSORE.

634.61 + 633.841 + 633.73 + 633.83

**Report of the Mysore Agr. Dept. for year ending June 30 1931,**  
pp. 207 [Received Nov. 1932].

The activities of the Department of special interest to this Bureau are here noted. *Coconuts*. On the experimental farms the coconut garden has come into general bearing and is being recorded for yield, size and weight of nuts and copra. Nuts from high yielders are being used for propagation and further study. Nuts from 10 of the highest yielding trees in the coconut breeding plots of the Department of Agriculture, Java, have been imported and a high percentage have germinated. *Pepper*. Improvement of pepper vines by selection of cuttings from high yielding vines shows very great promise. *Coffee*. First selections have been made from the breeding plots. The first definite Robusta  $\times$  Arabica hybrids produced in India have been planted out. A collection of all the commercially important species and varieties is nearing completion, and selections have been made from a number of them. The main object in view is to produce a variety equal in quality to the Mysore Arabica but resistant to Leaf Disease and Dieback. *Cardamoms*. Breeding and selection work has been started on this important plantation crop. Hitherto in India it is stated to have received little attention from workers in horticultural science.

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